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BYZANTINE AGRICULTURAL IMPLEMENTS: THE EVIDENCE OF MEDIEVAL ILLUSTRATIONS OF HESIOD'S *WORKS AND DAYS*

For Helen, in memory of Ellis

THE history of Byzantine technology is largely uncharted territory, especially in its most important field, the appearance, use, and development (or lack of development) of agricultural implements, where it has been argued recently that 'In the absence of any precise description of these tools, it is necessary to use Roman evidence'.[1] This article attempts to break ground by showing that a hitherto overlooked source, late medieval illustrations of Hesiod's great poem, *Works and Days* of the eighth century BC, in fact depict Byzantine agricultural implements, and links them with the scanty documentary and other evidence, summarized in the Table on p. 67. Most of the findings presented here indeed confirm the Roman evidence and modern survivals of classical ways of tilling, nor is their medieval context peculiar to Byzantium. But they demonstrate a formidable continuity of agricultural tradition in the eastern Mediterranean which Byzantine farmers preserved and to which they, occasionally, contributed their own devices.

THE CONTEXT

The principal means of Byzantine production, and eventual source of taxation, administration, and defence, was the muscle of its peasantry. In the absence of a work ethic, Byzantines had an approach to manual labour. It was to avoid it. The mark of all classes but the peasantry was that they did not soil their hands—with the exception of monks. *Typika* (monastic foundation and regulatory charters) name work as a good thing, a distasteful medicine: not necessarily useful work, but work for work's sake, for example to combat accidie among hesychast contemplatives. Such degradation is reflected in Lenten fare, which coincides closely with the peasant diet, although I do not think that any Byzantine author makes the social connection

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[1] A. Harvey, 'The Growth of the Byzantine Rural Economy 900–1200' (Birmingham, Ph.D. thesis, 1983), 168 = Harvey, Thesis. Dr Harvey is preparing this valuable thesis for publication by CUP. The study of medieval agricultural implements is much more developed in Russia, where there are parallels with Byzantium to explore, but the terrain and social conditions are different: see, for a start, B. Grekov, *Kiev Rus* (Moscow 1959) 70–90; R. E. F. Smith, *The Origins of Farming in Russia* (Paris–The Hague 1959).

explicit. But notions of labour and diet are linked in St John of the Ladder's notorious 'Prison', where backsliding ascetes of seventh-century Sinai were sent to plait baskets and eat such vegetation left over raw. As in Western medieval Europe, Byzantine snobbery was displayed conspicuously in food: the smartest was red meat from expensive pastoralism or hunting, fine white bread, and heliochrome wine. But modern dieticians would opt for the Byzantine monastic and peasant regime. This included: black breads; mountain porridge (*trachanas*); dairy products (with despised Vlach cheese); greens (Liutprand of Cremona bursts with contempt to find that the Byzantine emperor stoops to vegetables, but there is independent witness that Constantine VII Porphyrogenitus was both addicted to Bithynian lettuces and twitted for this eccentricity); salt fish (including caviare, or *botargo*, forerunner of *tarama*, which was no luxury and all that could be found on one midnight Lenten raid on a twelfth-century monastic larder); and maybe pork (from the painfully small hairy pig, which, before modern breeding, was to become the humiliating mark of Ottoman Christian *reʿya*). Not surprisingly, there are hints that monks lived longer than most on such health foods, struggling scholars (who complained most about them) had a life expectancy well into their sixties, and ascetic saints lived longest of all on nothing at all. More encouraging is the record of the Macedonian, Komnene, and Palaiologan emperors, who faced occupational hazards which were more than dietary, yet achieved an average age of around 60.[2]

Medieval peasant inertia has often been commented upon. One might fondly expect more stimulus from Byzantine landowners, who inherited ancient agricultural treatises and were capable of reading them. But in fact such gentry also made a virtue out of self-sufficiency, rather than exploitation. Kekaumenos warns against over-extending and advises investment in building or livestock only if essential.[3] *Autergia*—fruit- or olive-trees, which promised the greatest return for least labour—were the ideal. True stimuli to exploit for surplus were tax, tithe, and (to its limited extent) market demands, which were usually satisfied by bringing more land into cultivation rather than by more efficient tilling of what was already being farmed. The Islamic world brought new crops, such as Asiatic rice (which was to become a staple of the Ottoman military commissariat), but there is little sign of it taking root over the Byzantine borders.[4] Without external demands, the Byzantine (and Western) peasant holding was simply geared to its own reproduction. Even here there are signs of indifference to the need for maintaining the quality of the soil and avoidance of elaborate labour. In 1059 Eustathios Boilas, owner of two copies of St John's *Ladder*, but by his own account a progressive landowner, simply cleared by slash and burn. The Byzantine *Geoponica*'s section on manuring simply reproduces its classical prototype: *zarzaka* (Turkish *tezek*) dung-cakes were burnt, rather than dug into the ground. Vines, as in Portugal today, were simply allowed to run in olive groves, or propped, rather than trellised.[5]

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[2] T. Teoteoi, 'Remarques sur le travail manuel a Byzance au XIV^{e} siècle', *Etudes Byzantines et post-Byzantines*, E. Stănescu and N.-St. Tanaşoca (eds.), 1 (Bucharest 1979) 55-75; the same's 'Le Travail manuel dans les *typika* Byzantins des XI^{e}-XIII^{e} siècles', *Revue des Etudes Sud-Est Européennes* 17 (1979) 455-62; A. Karpozilos, 'Realia in Byzantine Epistolography X-XIIc', *BZ* 77 (1984) 20-37; D. J. Georgacas, *Ichthyological Terms for the Sturgeon and Etymology of the International Terms Botargo, Caviar and Congeners* (Athens 1978); contributions by Alice-Mary Talbot, Maria Dembińska, and Anthony Bryer to the 17th Spring Symposium of Byzantine Studies, 1983, summarized in *Bulletin of British Byzantine Studies* 10 (1984) 20-30; A. Bryer, 'The Estates of the Empire of Trebizond', *Ἀρχεῖον Πόντου* 35 (1979), reprinted in *The Empire of Trebizond and the Pontos* (London 1980) = Bryer, *CS* vii. 374-91; and the same's 'Byzantine Porridge', in *Studies in Medieval History Presented to R. H. C. Davis*, ed. H. Mayr-Harting and R. I. Moore (London 1985), 1-6; John Climacus, *The Ladder of Divine Ascent*, tr. C. Luibheld and N. Russell (London 1982), 105; M. Angold, *The Byzantine Empire 1025-1204* (London and New York 1984) = Angold, 236; C. Wickham, 'Pastoralism and Underdevelopment in the Early Middle Ages', *Settimane di studio del Centro italiano di studi sull'alto medioevo* 31 (Spoleto 1985) 430; Liutprand *Legatio*, XL, who is confirmed by Theodore of Kyzikos in *Epistoliers Byzantins du X^{e} siècle*, J. Darrouzès (ed.) (Paris 1960), 324, 327-9; cf. Bryer, *CS* vii. 385-6. Calculations of Byzantine life expectancy in A. Kazhdan and G. Constable, *People and Power in Byzantium* (Washington DC 1982) 53-5; and Alice-Mary M. Talbot, 'Old Age in Byzantium', *Byzantinische Zeitschrift* 77 (1984) 269.

[3] P. Lemerle, *Prolégomènes à une édition critique et commentée des 'Conseils et Recits' de Kekaumenos* (Brussels 1980).

[4] A. M. Watson, *Agricultural Innovation in the Early Islamic World; the Diffusion of Crops and Farming Techniques, 700-1100* (Cambridge 1983) 15-19.

It is, however, argued that demographic and even commercial factors, together with more efficient exploitation of its taxable resources by the state, stimulated Byzantine agriculture from the twelfth century. The period coincides with the evidence for implements presented here and with the development of Western tilling and milling technology. Yet, compared with the West, Byzantine evidence for real innovation is hard to find—except possibly where it seems to be derived from the West in such devices as the windmill. The profit motive is even harder to find: to Maximos Planoudes, himself a Hesiodic scholar, Arabic numerals and the cipher were still more a matter of curiosity than application in the thirteenth century, at a time when they were being employed for double-entry bookkeeping in the West, and, later, by western traders in Byzantium. Here no Byzantine could think of heading his accounts, as Giacomo Badoer did in Constantinople in 1436: 'In the name of God and good profit.'[6] But this is the period of our illustrations, which at least reveal a growing and informed interest in such banausic matters as mattocks in an unexpected quarter: that of Byzantine classical scholarship.

The most important source of improvement on the peasant's muscle is not in fact the devising of a new kind of implement, but the more efficient and wider use of metal to shoe the wooden tools he has. Iron is the key to any advance and, as Hesiod knew, even entirely wooden tools need iron to fashion them. A modern reflection of the relative value of iron and wood is provided by the costs of the tool in FIG. 19, made in Trebizond in 1981. The crooked-back wooden stem cost only £T200, the wooden handle £T60 and fitting them a further £T140, but the blacksmith's bill for the simple iron prongs came to £T1,300, over three-quarters of the total. Another forgotten factor is the high cost to the peasant's muscle of such tools: the ironwork of this one weighs 2.6 kg, and the woodwork 1.9 kg, resulting in a back-breaking implement three or four times heavier than a modern Western tempered fork. But it is iron-shod tools, ploughshares rather than wooden plough frames, which were thought worth listing in inventories. It is difficult to judge how widespread iron was, except to note that it was valued. The vast Carolingian manor of Annapes supported 200 head of cattle, but seems to have got by with two scythes, two sickles, and two iron spades. Whether because they were culturally unsuitable, or simply beyond the capabilities of Byzantine smiths, scythes and iron spades do not figure in our texts or illustrations and are rare enough in the region today. Michael Choniates complained that there were no smithies at all in late twelfth-century Athens; one could not get a knife made: carts and tools had to be got from the plain of Gardiki.[7] But by 1284 the Ionian estates of George Melissenos seem to have been slightly better equipped, with a cart, two plough-shares, two λίσκρας 'spade-forks', and two pick-axes, to till 12 *modioi* (2.5 acres) of vineyard and 300 *modioi* (62.5 acres) or arable.[8]

SOURCES AND METHOD

I am sure that the range of sources outlined below can, and should, be extended, but offer them as a start. There is, however, no Byzantine K. D. White, for whom Phaidon Koukoules is no substitute.[9] White reconstructs classical implements by applying etymological, textual, archaeological, and pictorial evidence, and the judicious use of survivals. His method, and much of his material, holds good for Byzantium too. It is happily superfluous to repeat his information, or Koukoules's heap of literary references, here. To these two basics may be added three recent unpublished theses which treat Byzantine implements usefully: by Dr John Nesbitt, Linda Cheetham, and Dr Alan Harvey respectively.[10] For etymology I have consulted, besides the more obvious lexica, those of Andriotes, Kriaras, and Papadopoulos, and do not repeat their citations.[11]

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[5] Lemerle, *Cinq Etudes sur le XIe* siècle Byzantin (Paris 1977) 22; cf. Harvey, Thesis 160–221; Bryer, *CS* vii. 394–5.

[6] Planoudes most accessible in N. Wilson, *An Anthology of Byzantine Prose* (Berlin–New York 1971) 126–9; A. Pertusi, 'La Tradizione manoscritta degli scolii alle Opere e i Giorni e le note inedite attribute a Massimo Planude', *Atti dell' VIII. Cong. int. di Stud. Biz.* i (Rome 1951), 177–82; *Il libro dei conti di Giacomo Badoer*, ed. V. Dorini and T. Bertelè (Rome 1956), 1; cf. N. Oikonomidès, *Hommes d'affaires Grecs et Latins à Constantinople* (*XIIIe–XVe siècles*) (Montreal–Paris 1979) 130–1.

[7] G. Duby, *Rural Economy and Country Life in the Medieval West* (London 1962) 16–22; Angold, 249.

[8] F. Miklosich and J. Müller, *Acta et diplomata graeci medii aevi* (Vienna 1860–90) iv. 267–71 = *Melissenos Will.*

A rough indication of the relative incidence of various implements is provided in summaries on the left-hand side of the Table on p. 67 of the following texts:

A The so-called 'Farmer's Law', probably seventh-century.[12]
B The edition of the *Geoponica* ascribed to Constantine VII Porphyrogenitus (913–59).[13]
C The inventory of Xylourgou monastery, which passed to the Athonite monastery of Pantaleimon, in 1142.[14]
D The will of the monk Gerontios for the Lembiot monastery of St Marina, near Smyrna, in 1192.[15]
E The will of the *tzaousios* George Melissenos for Lembo monastery, near Smyrna, in 1284.[16]
F The will of Kalana Spelianitopoulos, crofter of Matzouka valley south of Trebizond, near the Pontic monastery of Vazelon, for members of her family, in the thirteenth century.[17]
G The wills (two versions) of Theodosios Skaranos (monastic name Theodoulos) of property around Hermilia, for the Athonite monastery of Xeropotamou, *c.*1270–4.[18]

Published archaeological evidence is woefully thin, but Romanian archaeologists offer small iron finds from Moldavia, Dinogetia (tenth century on),[19] and Păcuiul lui Soare (thirteenth–fifteenth centuries).[20] No site was primarily agricultural, but Dinogetia has yielded what is described as 'une faux'. Among other items, twelfth-century Nemea offers an iron rake sprouting five claws, two on each side and one at the tip of a shaft 17.7 cm long.[21] There are surely other unregarded tools in museum basements, including, it is said, at Olympia.[22]

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[9] K. D. White, *Agricultural Implements of the Roman World* (Cambridge 1967) = White. Cf. the same's *Roman Farming* (London 1970). Ph. Koukoules, *Βυζαντινῶν βίος καὶ πολιτισμός* (Athens 1952) = Koukoules, *BBP* v.

[10] J. W. Nesbitt, 'Mechanisms of Agricultural Production on Estates of the Byzantine Praktika' (Wisconsin, Ph.D. dissertation, 1973) = Nesbitt, Thesis; Linda Cheetham, 'A Study of Traditional Technology in Greece and Cyprus as a Demonstration of the Value of Ethnography to Archaeology' (Institute of Archaeology, London, BA dissertation, 1981) = Cheetham, Thesis; cf. the same's 'Threshing and Winnowing—An Ethnographic Study', *Antiquity* 56 (1982) 127–30 and pl. xvi; Harvey, Thesis (see n. 1 above).

[11] N. P. Andriotes, *Ἐτυμολογικό λεξικό τῆς κοινῆς νεοελληνικῆς* (Athens 1951) = Andriotes; E. Kriaras, *Λεξικό τῆς μεσαιωικῆς ἑλληνικῆς δημωδοῦς γραμματείας, 1100–1669* 1– (Thessalonike 1968) up to KA = Kriaras; A. A. Papadopoulos, *Ἱστορικόν Λεξικόν τῆς Ποντικῆς διαλέκτου*, 2 vols. (Athens 1958–61) = Papadopoulos.

[12] W. Ashburner, 'The Farmer's Law', *JHS* 30 (1910) 85–108; 32 (1912) 68–95, esp. ch. 20 = *Farmer's Law*; cf. Lemerle, *The Agrarian History of Byzantium* (Galway 1979) 27 ff.; see now I. P. Medvedev, *Nomos Georgikos* (Leningrad 1984) 93 ff.

[13] *Geoponica sive Cassiani Bassi Scholastici de re Rustica Eclogae*, H. Beckh (ed.) (Leipzig 1895) = *Geoponica*.

[14] P. Lemerle, G. Dagron, and S. Ćirković, *Actes de Saint-Pantéléèmôn* = *Archives de l'Athos* ix (Paris 1982) 65–76, esp. 72 (commentary) and 74 (text) = *Xylourgou Inventory*.

[15] Miklosich and Müller, *Acta et diplomata* iv. 202 = *Gerontios Will*. Cf. Angold, *A Byzantine Government in Exile* (Oxford 1974) 121–46.

[16] Miklosich and Müller, *Acta et diplomata* iv. 267 = *Melissenos Will*. Cf. Hélène Ahrweiler, 'L'Histoire et la géographie de la région de Smyrne entre les deux occupations Turques (1081–1317), particulièrement au XIIIᵉ siècles', *Travaux et Mémoires* i (1965) 172.

[17] F. J. Uspenskij and V. V. Bénéshévich, *Vazelonskie Akty. Actes de Bazélon* (Leningrad 1929), Act 118 of the thirteenth century = *Spelianatopolous Will*.

[18] J. Bompaire, *Actes de Xéropotamou* = *Archives de l'Athos* iii (Paris 1964) 71–88, esp. 77 (commentary) and 80, 84 (texts) = *Skaranos Will*.

[19] G. Stefan, I. Barnea, and M. Comsa, *Dinogetia I* (Bucarest 1967) 392; I. Barnea, 'Dinogetia—Ville Byzantine du Bas-Danube', *Βυζαντινά* 10 (1980) 265 = *Dinogetia*; V. Spinei, *Realităţi şi politice în Moldova Meridionala în secolele X–XIII* (Iaşi 1985) = Spinei. I am grateful to Nubar Hamparţumian for this reference.

[20] P. Diaconu and Silvia Baraschi, *Păcuiul lui Soare. Aşezarea medievală secolele XIII–XV* ii (Bucarest 1977) = *Păcuiul lui Soare*.

To the evidence of survivals employed by White may be added, for the Byzantine world, useful publications by the Benaki Museum, Athens, of their holdings;[23] and by the Greek Pontic community of their recollections of Anatolian agriculture before 1923.[24] Cheetham has examined the collections of implements in the Faltaits Museum on Skyros and at Yeroskepos on Cyprus. I have noted tools in the Odessa, Tokat, Tirana, Munich, and Tripoli museums and, especially, in the Village Museum in Bucharest and in the Russian Museum in Leningrad. I have not seen the Russian imperial collection of agricultural implements which was allotted to the Grand Duchy of Finland and inherited by the Helsinki Museum. I have published survivals of traditional agriculture in the Pontos.[25] The pitfalls of using such evidence are obvious: the search for the Byzantine *λίσγον* may lead to a modern implement on Chios, where its form turns out to be that of a Western garden fork and its local name, *τσάταλ*, Turkish *çatal*.[26] I have once broken the rule that one cannot work back from such 'survivals' alone by venturing that Byzantine methods of reaping required the modern devices shown in FIG. 20, for which all other sources are profoundly silent.

Pictorial evidence for our tools is curiously lacking in wall-painting, nor, among manuscripts does, for example, the Madrid Skylitzes run to a single pruning hook.[27] But, besides Hesiodic illustrations, some Byzantine illuminations of agricultural implements may be noted:

Ninth-century: Moscow Hist. Mus. 109 (Khludov Psalter), 106^{r} (cart);[28] Milan, Ambros. E49–50 inf. pag. 755, homilies of St Gregory Nazianzenus (large axe);[29]

Eleventh-century: Athos Esphigmenou 12 f. 368^{v}, menologion (sickle, threshing sledge);[30] Jerusalem Patriarchal Library, Holy Sepulchre 14 f. 33^{r} (sickle);[31] Paris. gr. 533 f. 34^{r-v}, homilies of St Gregory Nazianzenus (sole ard, sheep shears, vine-dresser's knife);[32] Paris. gr. 74 f. 39^{v}, gospels (see below).[33]

Twelfth-century: Athos Panteleimon 6 f. 37^{r}, homilies of St Gregory Nazianzenus (sole ard);[34] Venice, Marc. gr. 479 f. 24^{v} (sole ard);[35] Smyrna and Seraglio Octateuchs (sole ards);[36]

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[21] S. G. Miller, 'Excavations at Nemea', *Hesperia* 14 (1975) 162 and pl. 39*d–f* = *Nemea*.

[22] Information from Professor Speros Vryonis, Jun.

[23] Benaki Museum, *Παραδοσιακές καλλιέργειες* (Athens 1978) = Benaki.

[24] Ch. G. Demarchos and N. I. Kapnas, *'Ο 'Ελληνικός Πόντος. Μόρφες καὶ εἰκονες ζωῆς* (Athens 1947) = Demarchos and Kapnas. There is a wealth of other material from the Pontos, e.g. in S. Athanasiades, *'Ιστορία καὶ λαογραφία τῆς Σάντας*, 2 vols. (Thessalonike 1967–8).

[25] Bryer, *CS* vii.

[26] A. C. Smith, *The Architecture of Chios* (London 1962), esp. 47 and fig. 116 (= Smith, *Chios*).

[27] A notable exception in the dearth of wall-painted evidence is Doula Mouriki, 'An Unusual Representation of the Last Judgement in a Thirteenth-century Fresco at St. George near Kouvaras in Attica', *Δελ. τῆς Χρ. Ἀρχ. Ἔτ.* 8 (1975–6) 145–71 = Mouriki.

[28] M. V. Chepina, *Miniatury Khludovskoy Psaltiri* (Moscow 1977) pl. 106.

[29] K. Weitzmann, 'The Selection of Texts for Cyclic Illustration in Byzantine Manuscripts', in *Byzantine Books and Bookmen. A Dumbarton Oaks Colloquium* (Washington DC 1975), 94 and fig. 39.

[30] S. M. Pelekanides, P. C. Christou, Ch. Tsioumis, and S. N. Kladas, *The Treasures of Mount Athos. Illuminated Manuscripts* ii (Athens 1975) (= *Athos* ii), 371 (where the sledge is oddly identified as a plough) and pl. 347; M. Kaplan, 'Quelques remarques sur les paysages agraires Byzantins ($VI^{ème}$ siècles—milieu $XI^{ème}$ siècle)', *Revue du Nord* 62 (1980) (= Kaplan) fig. 5.

[31] Kaplan, fig. 6; G. Galavaris, *The Illustrations of the Liturgical Homilies of Gregory Nazianzenus* (Princeton 1969) pl. 16 fig. 103; G. Schlumberger, *L'Épopée Byzantine à la fin du dixième siècle*, 3 vols. (Paris 1896–1905, reprinted Darmstadt 1969) (= Schlumberger), iii. 125.

[32] Kaplan, fig. 2; H. W. Haussig, tr. J. M. Hussey, *A History of Byzantine Civilization* (London 1971) (= Haussig) 415 pls. 82, 83; Bibliothèque Nationale, *Byzance et la France médiévale* (Paris 1958) 15 pl. xiii; Schlumberger, i. 513, 517.

[33] H. O(mont), Bibliothèque Nationale, *Evangiles avec peintures Byzantines du XI^{e} siècle* (Paris 1908) i pl. 33; Schlumberger, i. 473.

[34] *Athos*, ii fig. 299; Kaplan, fig. 1.

[35] I. Furlan, *Codici greci illustrati della Biblioteca Marciana* iv (Milan 1981) (= Furlan) fig. 20.

[36] T. Uspenskij, *L'Octateuque de la Bibliothèque du Sérail à Constantinople* (Munich-Sofia 1907), Album, 270 pl. xli, 316 pl. xlvii; L. Bréhier, *Le Monde Byzantin* iii (Paris 1950) pl. xvi; Koukoules, *BBP* v pl. viii.

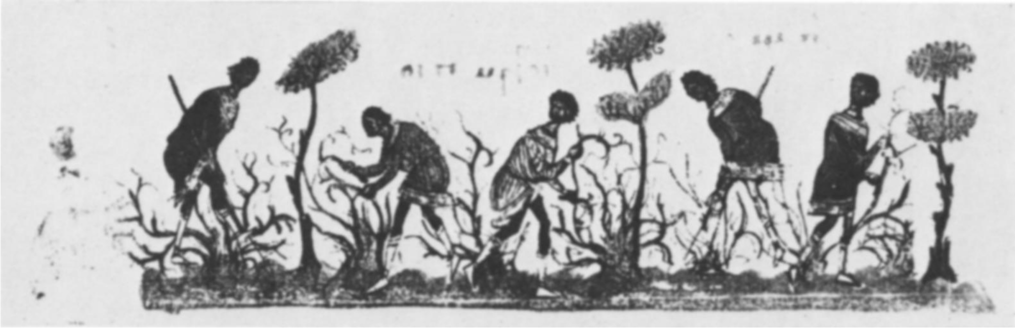

FIG. 1. Paris. gr. 74 f. 39^{v}: the Labourers in the Vineyard

1346: Athos Vatopedi 320/954, *typikon* of St Eugenios monastery, Trebizond, Labours of the Months (including sole ard and sickle).[37]

Because these scenes have been widely reproduced elsewhere, I illustrate only the best known here: Paris. gr. 74 f. 39^{v} in FIG. 1. It shows the Labourers in the Vineyard of Matthew 20: 1–16 and has proved irresistible to editors seeking a convenient illustration of Byzantine agriculture. Nevertheless, modern interpreters have evidently felt that there is something wrong with the picture. One comes up with an unexpected problem: 'The Byzantine painter . . . has substituted a sunflower field for the vineyard of the Gospel.'[38] The painter may be excused such clairvoyance: sunflowers were not introduced to Europe from North America until the sixteenth century. He clearly depicted vines in what is clearly captioned a vineyard; the bushy-top trees among them are in a Byzantine convention and may perhaps represent the olives up which vines were commonly trained. Another recent interpreter comes up with a shameless solution to another problem: she reproduces the digging tools wielded by the first and fourth figures firmly redrawn to look like modern Western garden spades—implements quite unknown to Byzantines.[39] What in fact the painter intended the labourers to work with is indeed a problem: they look like sickles and the *lisgari* 'spade-fork'. These are not tools for a vineyard, for which Byzantines specified the *kladeuterion* vine-dresser's knife, and *dikelli* two-pronged drag-hoe. The real solution may simply be that this particular painter was a better artist than vineyard labourer, and misinterpreted his model.

FIGURE 1 may illustrate the most dangerous pitfall in the use of manuscript illuminations, which comes in their very inheritance. In fact most pictures listed above are probably more or less of *realia*, but they are surrounded by well-known problems raised by lost prototypes and a sequence of copyists. For example, do the illustrations to Marc. gr. 479, Ps.-Oppian's *Cynegetica*, tell us more about classical or Byzantine hunting with dogs? Spatharakis finds a complex of originality, and transmission and adaptation of earlier models, and offers guide-lines to detecting them.[40] We are on safer ground with, for example, Holkham 311, Virgil's *Georgics*. No

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[37] J. Strzygowski, 'Eine trapezuntinische Bilderhandschrift vom Jahre 1346', *Repertorium fur Kunstwissenschaft* 13 (1890) 241–63; Bryer, *CS* vii. 392–3 figs. 1, 9, 29, 31.

[38] Haussig (or maybe Hussey), 416 pl. 85.

[39] Tamara Talbot Rice, *Everyday Life in Byzantium* (London 1967) 188 fig. 80. Helen Nixon Fairfield is credited with the redrawing.

[40] Weitzmann, *Ancient Book Illumination* (Harvard 1959) (= Weitzmann) 26–30; Z. Kádár, *Survivals of Greek Zoological Illuminations in Byzantine Manuscripts* (Budapest 1978); C. Diehl, *Manuel d'art Byzantin* ii (Paris 1926) 603; R. Fossier (ed.), *Le Môyen Age* ii (Paris 1982) 205; A. Bryer, T. Trautman, and L. K. Young, *Byzantium and the Ancient East* (London 1969) 12 (for illustrations of the Ps.-Oppian). I. Spatharakis, 'Observations

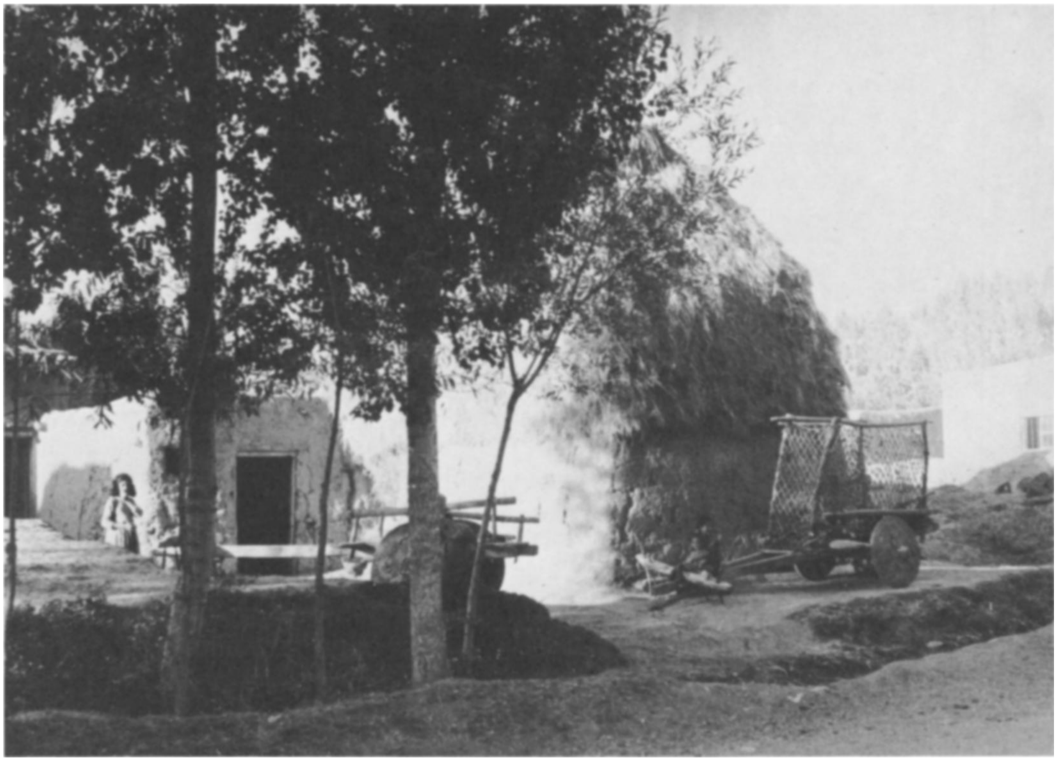

FIG. 2. Disc-wheel cart with rick, Lake Van, 1967

one can mistake its illustrations as being of Roman farming in the first century BC; they, and especially scenes unrelated to the text, are the realities of the artist's fifteenth-century Flanders, drawn as fresh as Bruegel. The *Georgics* are hardly a practical guide to medieval Flemish agriculture, but such considerations did not stop the Byzantine Nikolaos Myrepsos's fourteenth-century medical treatise being a set book in the seventeenth-century Sorbonne, or the *Geoponica* itself being reissued, for the edification of British farmers it seems, in 1805.[41] To the late Byzantine, Hesiod's *Works and Days*, in fact a work of 'wisdom literature', *ought* to have represented an even greater leap in time and an even less relevant guide to the practical agriculture of his day. But that is to ignore the thought-world of a twelfth-century pundit such as Tzetzes. His contemporary, Theodore Prodromos, was perhaps jibing at Tzetzes's edition of *Works and Days* when he satirically pointed out the paradox that grammarians, who could read

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on a Few Illuminations in Ps.-Oppian's Cynegetica MS. at Venice', *Thesaurismata* 17 (1980), 22–35 and pls. i–viii, makes some observations which he suggests may apply to other manuscripts: that (1) not all 'scientific' miniatures are fully explained by the text, and some are not even related to it; (2) a figure in Byzantine costume does not necessarily imply that it was invented or added by a Byzantine artist; (3) bizarre figures suggest that the artist did not have a model; (4) the copying artist usually did not read the passage which he was illustrating, but copied his model blindly; (5) a miniature, fully explained by a text, was definitely invented for it when the passage which it illustrates or the scene are original; and (6) a miniature which is not explained by the text, or contains more details than the text, has been copied from somewhere else.

[41] Cf. R. Browning, 'Byzantine Scholarship', *Past & Present*, 28 (1964) 19; White, *Roman farming* (London 1970) 45–6; *Geoponica, Agricultural Pursuits*, tr. T. Owen (London 1805).

Hesiod, did not need him; while tillers of the soil, who needed Hesiod, could not read him.[42] The point is that Prodromos, if not Tzetzes, evidently thought that Hesiod was of use to Byzantine peasants. Was the provision of more elaborate illustrations to *Works and Days* thereafter a real, if dotty, attempt to make Hesiod accessible to live farmers? Whatever the motive, I will argue that (like the Flemish illustrations to Holkham 311, as opposed to the Byzantine ones of the Ps.-Oppian) Byzantine Hesiodic illuminations offer fresh and realistic clues to medieval tools, especially wooden ones otherwise lost to documents and archaeology.

BYZANTINE ILLUSTRATIONS OF HESIOD

After the papyri, which have no known illustrations, there are over 260 manuscripts of Hesiod's *Works and Days*, about 160 before the first printed edition of about 1480 and over thirty of before 1340. Of these at least fourteen (listed chronologically, I–XIV, on the right of the Table on p. 67) are illustrated with pictures of agricultural implements (FIGS. 3–16), and two more have spaces in the text for illustrations.[43] No more than West have I checked on all surviving Hesiodic manuscripts, but partly through his and Dr Mary Cunningham's kindness, can list, but not here, over thirty of the earlier ones especially which do *not* have illustrations. Numbers VII, X, and maybe IX have illustrations added at the end and seem to labelled in a hand other than those of the text or scholia. The remainder are inserted in text or margin; the traditional place is at lines 423–36, which describe the mortar, pestle, mallet, wheel and parts of the cart, and parts of the plough, and illustrate them. Lines 468–70 mention the goad and mattock to complete the inventory of named implements, A.1–6 in the Table. Iron sickles and axes are alluded to (not by their Byzantine names) in lines 387, 420–31, and 573, pruning in line 550, and threshing in line 597, but these passages are not illustrated, although they may have encouraged extending the range of tools shown.

This leaves a total of seventeen further implements, B.1–17 in the Table, not directly named by Hesiod, the Scholia Vetera or Scholia of Proclus, which were added by Byzantine illustrators and which should therefore be contemporary with them.

Weitzmann observes that if the *Works and Days* 'ever was illustrated at an early time, the only kind of picture we would expect from the art historical point of view, should rather be associated with the pure scientific and not the semi-poetical books'.[44] Although there is no surviving illustration from before the tenth century, some of the illustrations in the first group, A, have indeed the air of belonging to a tradition which may have been very old: specifically the schematic plough and its named parts, and the wheel and parts of a cart (both of which are necessary aids to quite complex passages), together with the mortar which is shown in cross-section. This diagrammatic group had a long life after the tenth century. The latest manuscript in the tradition, XIV of the sixteenth century, has illustrations even more elementary than the first, I, which already includes one item not named in Hesiod or the early scholia (FIGS. 3–4). On the guide-lines of Spatharakis, the purist might dismiss the evidence of implements in group A on the grounds that it looks to some unknown earlier if not antique model, were it not for its diversity. True, the plough is illustrated 'realistically' only once (FIG. 10), but it is no more than the sole ard, the only type illustrated in other Byzantine

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[42] G. Podestà, 'Le Satire Lucianesche di Teodoro Prodromo', *Aevum* 19 (1945) 247. I am most grateful to Dr Roddy Beaton for this reference and discussion, but any error in linking Prodromos with Tzetzes is my own.

[43] M. L. West, *Hesiod, Works and Days* (Oxford 1978) (= West), esp. 60–86; cf. the same's 'The Medieval Manuscripts of the *Works and Days*', *CQ* 24 (1974) 161–85. The Scholia Vetera and those of Proclus are in Pertusi, *Scholia Vetera in Hesiod Opera et Dies* (Milan 1955) (= Pertusi); the scholia of Tzetzes and Moschopoulos are in T. Gaisford, *Poetae Minores Graeci* ii (Oxford 1820) (= Gaisford).

[44] Weitzmann, 23.

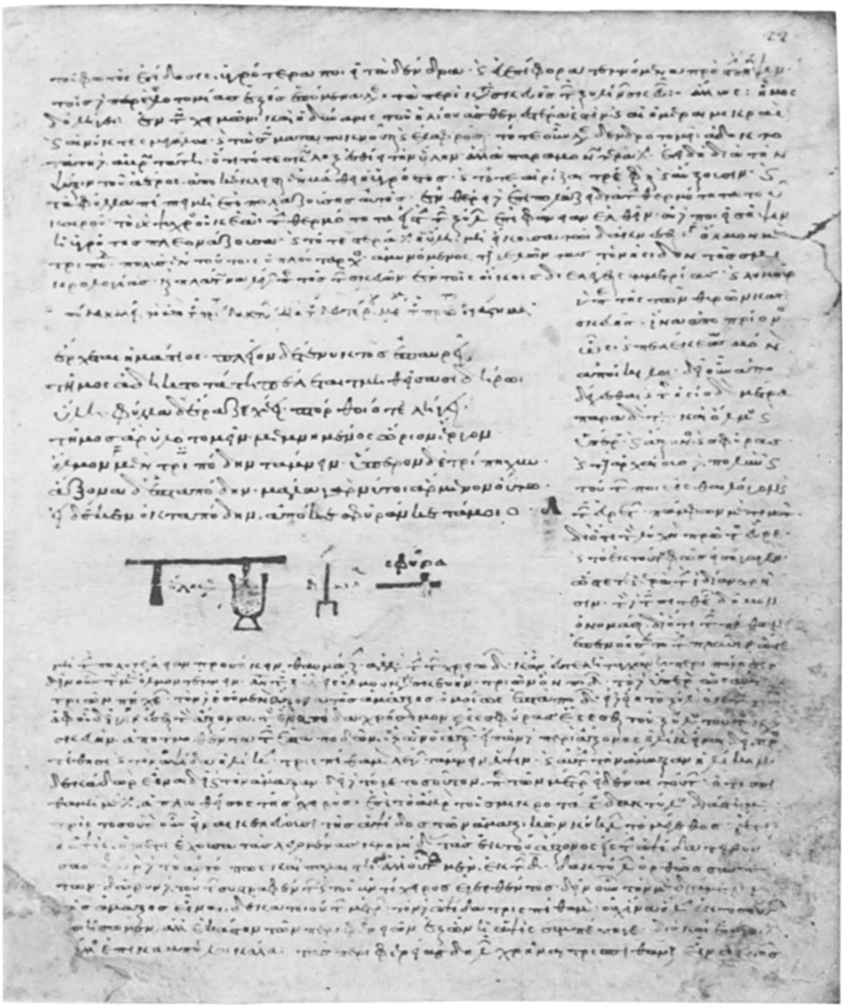

FIG. 3. Illustrator I. Paris. gr. 2771 f. 22^{r}

manuscripts. True, the cart is illustrated diagrammatically in FIGS. 6 and 14, and its parts in FIGS. 5, 7, 11, 12, 15 and in manuscript XIV, but FIGS. 5, 8, and 10 show 'realistic' carts, which, like that of the Khludov Psalter, evidently took a contemporary cart track. Leaving aside the manuscript tradition of the text, a first glance at FIGS. 3–16 indeed reveals no obvious parallel one of copyists of illustrations, beyond the tradition that at lines 423–36 the scribe was free to improvise his own array of agricultural implements, which burgeoned in numbers. I say 'the scribe', which begs a famous question: did the copyist or copyists do their own drawings? Working with photographs alone, one cannot compare inks, and can only venture identification of hands which captioned the drawings. It looks as if the labels at least of manuscripts I, II, V, and XI are in the hands of the main text, and those of III, IV, VI, XII, and XIV of the scholia to them. Manuscripts VII, VIII, IX, maybe X, and XIII appear to have captions in new hands. But I am not too concerned about this question here for, as Weitzmann pointed out, we

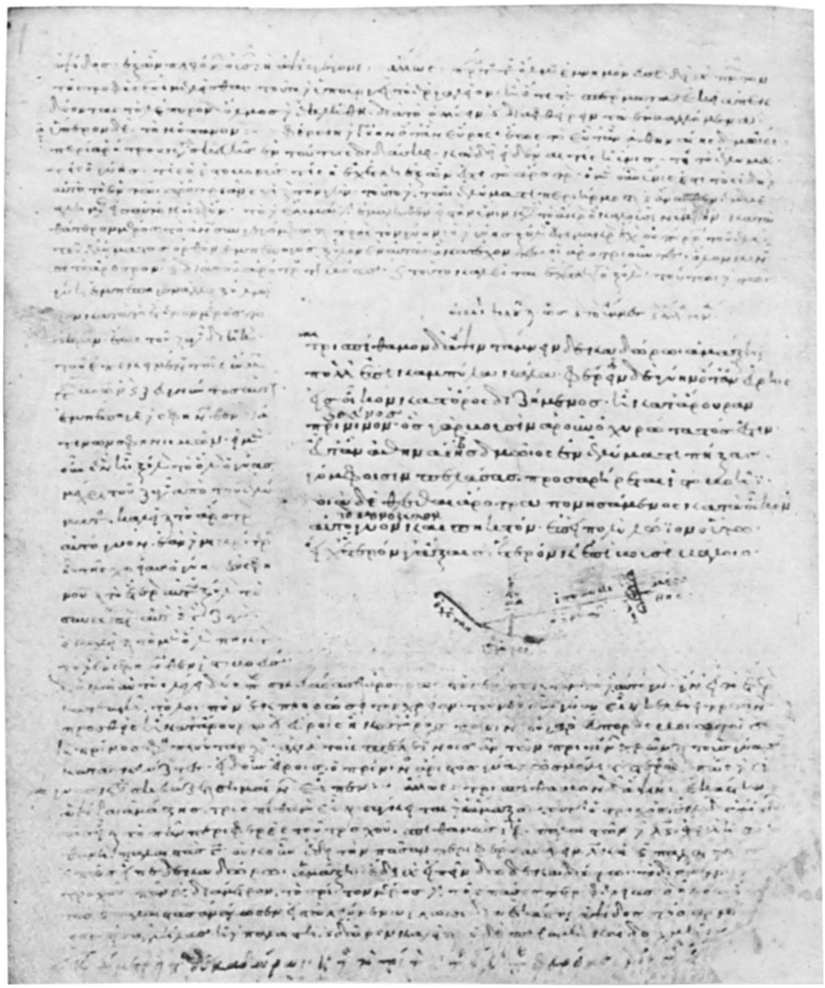

FIG. 4. Illustrator I. Paris. gr. 2771 f. 22$^{\mathrm{v}}$

are not following an art historical tradition, such as the complex styles of the ps.-Oppian manuscript. Group A is simple, diagrammatic and 'scientific'. It calls for a minimum of drawing on the part of the scribe, though he or another can expand it at will. Pictures appear only once in each illustrated manuscript, and, with the splendid exception of VI (a special case), none can be regarded as great examples of Byzantine art. This makes the pictures, and especially the two or more attempts to depict the same tool in III, IV, VII, IX, and XI, all the humbler and more 'realistic'.

A second glance at FIGS. 3–16 shows that what illustrative tradition we have is not at variance with the manuscript tradition which West has convincingly disentangled. For example, a major, but secondary, manuscript family is ϕ, to which five illustrated manuscripts belong:[45]

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[45] West, 83–4.

II. Vat. gr. 2383, of 1287, *ϕ*3 (FIG. 5).[46]
III. Cantab. Trin. o. 9. 27, thirteenth-century, *ϕ*4 (FIG. 6).[47]
V. Yale, Beinecke Library 254 (Phillipps 3875) of 1301, *ϕ*5 (FIG. 8).
VIII. Paris. gr. 2773, fourteenth century, *ϕ*8 (FIG. 12).
XI. Vat. Ottob. gr. 210, of 1363, *ϕ*10 (FIG. 15).[48]

Add to these two manuscripts of the *ϕ* family which (perhaps alone of Hesiodic manuscripts) leave spaces for illustrations which have not been used: Messanius F. V. 11 of the twelfth century and Vindob. phil. gr. 191. This suggests a requirement at which two copyists jibbed, perhaps inherited from a stream from the lost hyparchetype *Φ*, which is not the first in the tradition of adding explanatory drawings. The *ϕ* illustrations (FIGS. 5, 6, 8, 12, and 15) provide a case for looking at illustrations as a characteristic of the family. Two other characteristics are that *Φ*, datable to the period 1140–80, was 'either written in south Italy (Otranto is the obvious centre) or brought there within a few years of being written',[49] where some, perhaps all manuscripts were copied; and that the family is associated with the scholia added by the cantankerous John Tzetzes, probably in Constantinople and completed in about 1135–40.[50] Do the illustrations follow a pattern too?

Illustrations in II, III, V, VIII, and XI of the *ϕ* family are not adventurous, particularly in the schematic plough, and are largely limited to tools named in Group A, although to these XI adds two examples of *στάχυς* which is the main Byzantine crop of barley (FIG. 15). In manuscript II (FIG. 5) Colonna maintains direct links with both Tzetzes and southern Italy. This illustration has conventional and perfunctory drawings of a goad, mattock, and plough characteristic of family *ϕ*, but the cart is another matter. Colonna identifies the yellow ochre of its colour as typical of southern Italian copyists, and maintains that *ὁ ἄνθρωπος* who drives it so furiously refers to Tzetzes's commentary on lines 424–46.[51] Tzetzes's scholia have a character of their own. No academic copyist can resist his observation on lines 414–22 that some people, including Alexander the Great and himself, were naturally fragrant, 'although I do not use scents or anoint myself, or take baths either, except two or three times a year'.[52] But, while their illustrations confirm to some extent the other features of the *ϕ* family, they are more of a hindrance than a help to Colonna's thesis. First, although Tzetzes goes into some explanatory detail on cart and plough construction, he does not add any new term or implement which might be reflected in the illustrations, cart driver included.[53] Secondly, although the texts of II and III (FIGS. 5 and 6) are in the same hand, their illustrations for the same lines are entirely different. Thirdly, is the southern Italian connection. If the *ϕ* family of manuscripts comes from Italy, its illustrators demonstrate a rare uniformity of terminology, as well as appearance of tools, from there to the Balkans and Anatolia. A case in point is the mattock, Hesiod's *μακέλη*, Byzantine *μακέλλα*. Its Italian equivalent is the *zappa*, known to Dante and Bocaccio, still an essential tool, which has been derived from the Latin *capreolus*, a rather specialized Roman asparagus hoe.[54] For practical purposes the *τζάπιον*, now *τσάπα*, was superseding the *μακέλλα* by the time of the *Xylourgou Inventory* of 1142. The word entered the Macedonian dialect,

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[46] A. Colonna, 'Homerica et Hesiodea', *Bollettino del Comitato per la preparazione dell'Edizione Nazionale dei Classici Greci e Latini* 3 (1955) 45–55 pl. 1; A. Turyn, *Codices graeci Vaticani saeculis XIII et XIV scripti annorumque notis instructi* (Vatican City 1964).

[47] F. A. Paley, *The Epics of Hesiod, with an English Commentary* pl. opposite p. xxxiv; Weitzmann, fig. 28; Furlan, iv. 27.

[48] Colonna, 'L'Esamplare *Φ* degli *Erga* Esiodei', *Bollettino del Comitato per la preparazione dell'Edizione Nazionale dei Classici Greci e Latini* 6 (1958) (= Colonna) 22.

[49] West, 83.

[50] West, 83; Colonna, 21.

[51] Colonna, 21.

[52] Gaisford, ii. 226; West, 69; N. G. Wilson, *Scholars of Byzantium* (London 1983) (= Wilson) 191.

[53] Gaisford, ii. 228–33, 242–5; Colonna, 21.

[54] White, *Implements* 58.

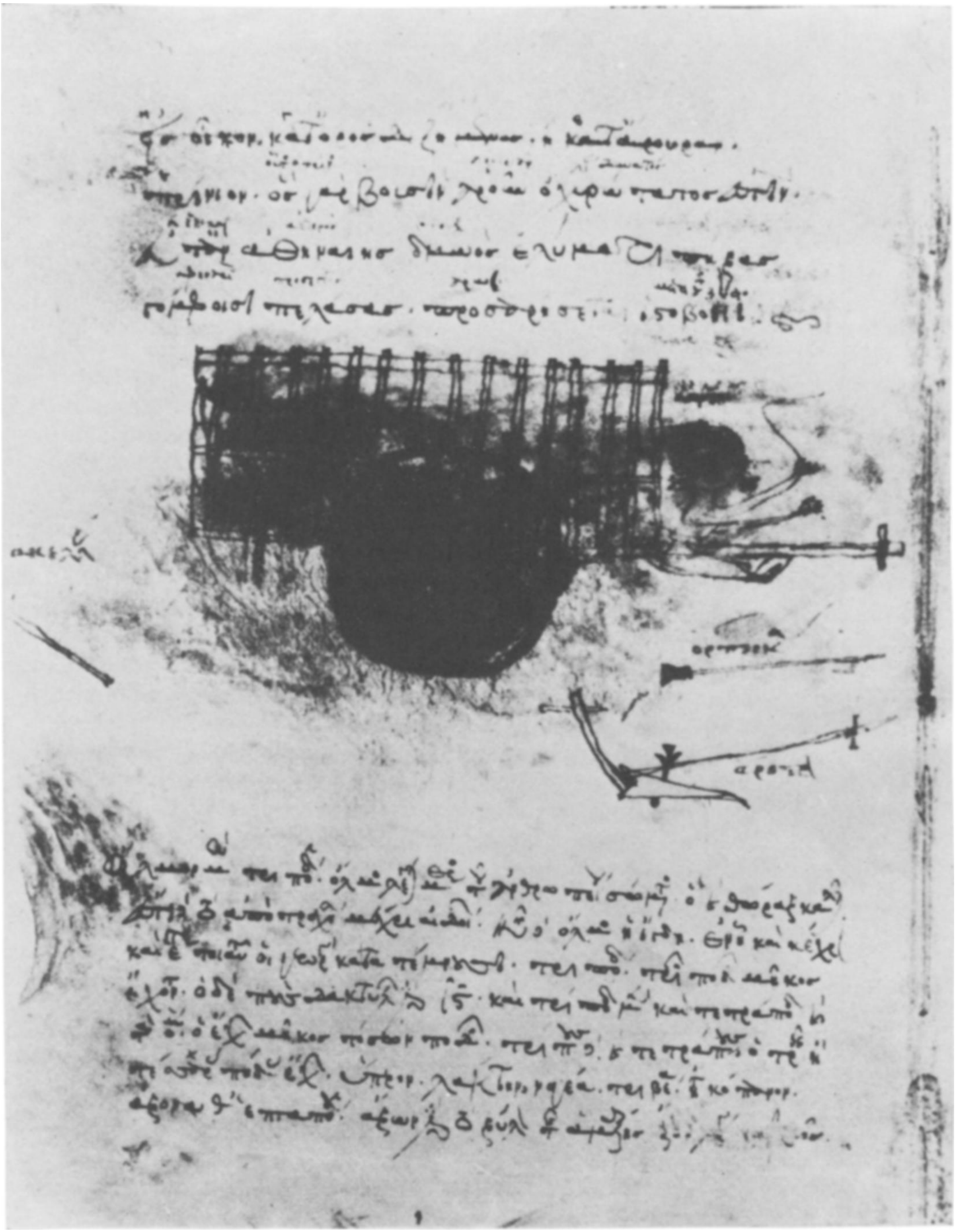

Fig. 5. Illustrator II. Vat. gr. 2383 f. 62$^{\mathrm{v}}$

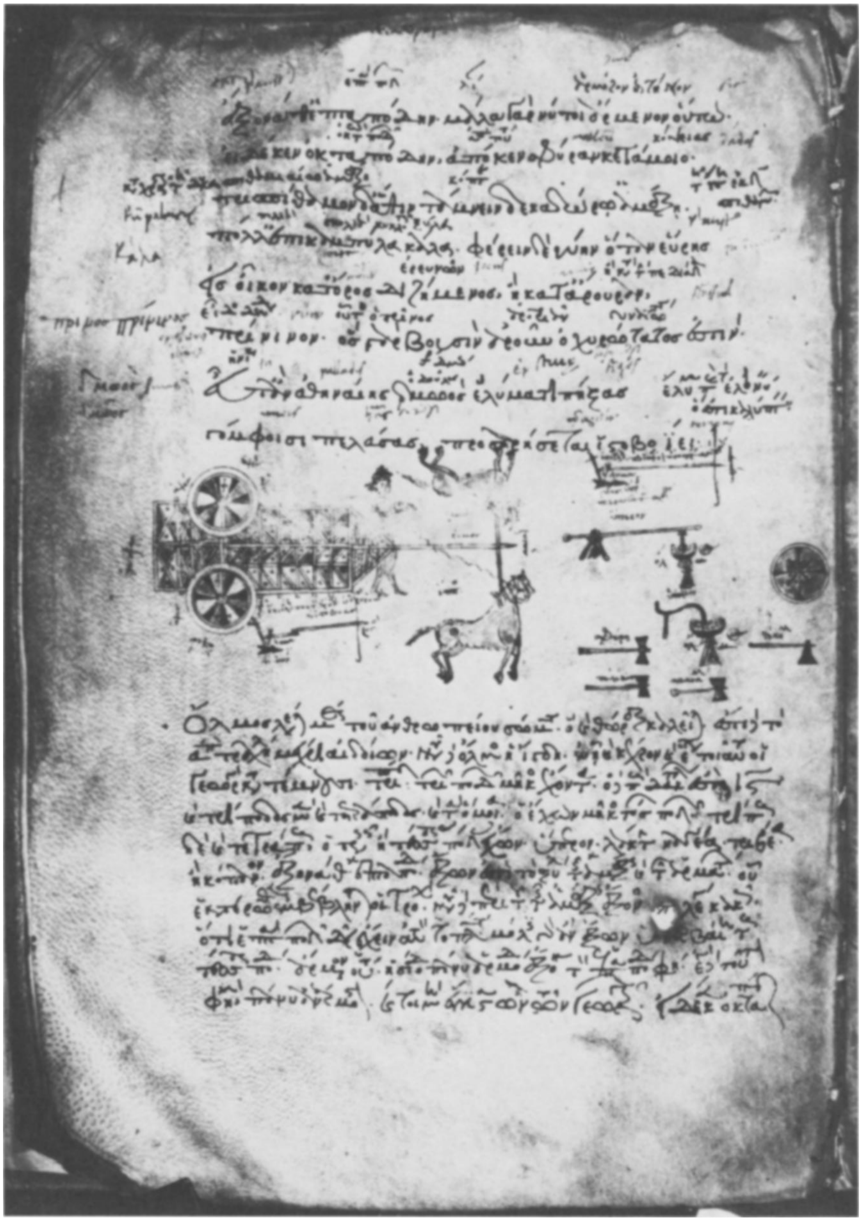

FIG. 6. Illustrator III. Cantab. Trin. 0.9.27 f. 44^{v}

presumably through Greek, for it is not Slav and does not appear in Bulgarian.[55] Andriotes is surely right in deriving Byzantine *τζάπιον* and its cognates from Italian *zappa*, whatever one may think of the *capreolus* origin. But the problem is that it is Demetrios Triklinios whose illustration of 1316–19 alone explains in the caption that the *μακέλη* is now the *τζάπιον* (FIG. 10; see below).

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[55] Andriotes, 265; *Rečnik na makedoniskiot jazik* iii (Skopje 1966) 529. I thank Drs Harry Davis, Dimitrios Tziovas, and Michael Ursinus for discussion.

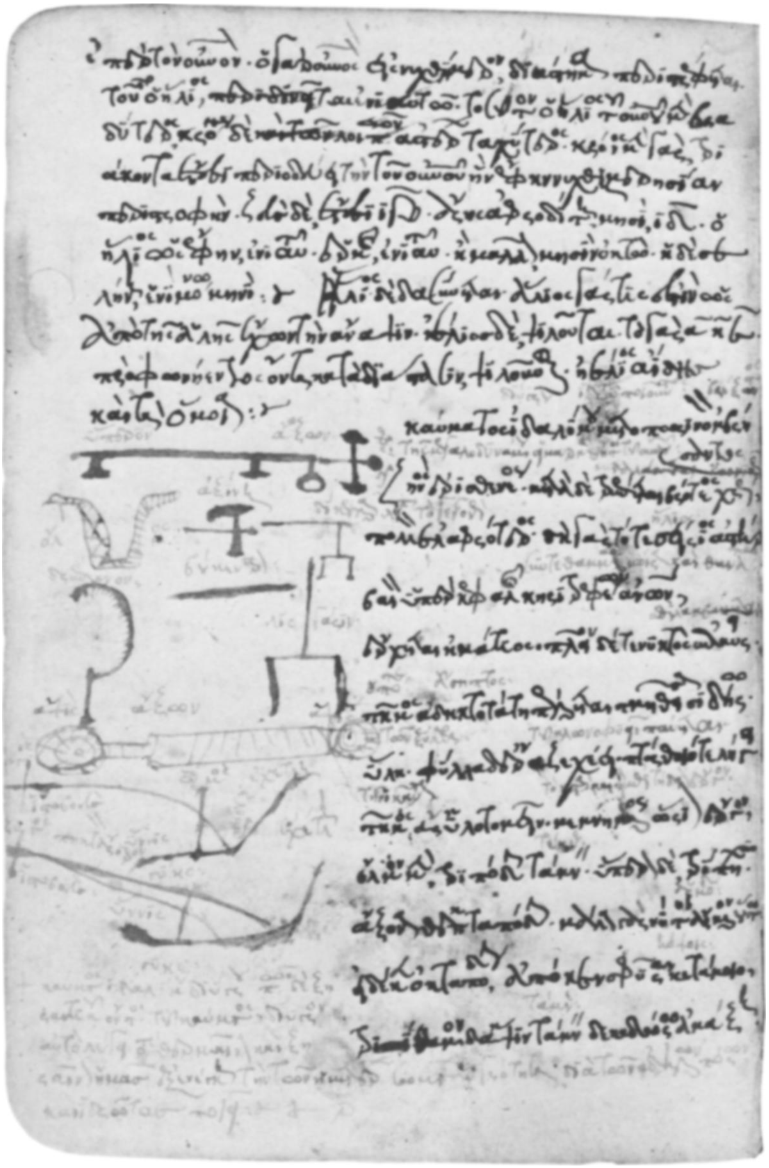

FIG. 7. Illustrator IV. Paris. gr. 2774 f. 36^{v}

Triklinios worked in Thessalonike; the supposedly Italian family of manuscript label no *zappa*, but caption the hoe as Byzantine *μακέλλα*.

The conclusion is that its tradition of illustrations, especially of the ones named in Hesiod, not unexpectedly confirm *ϕ* manuscripts as a family, but that their relationship to Tzetzes's scholia is difficult to prove and their connection with southern Italy even more so. Apart from the simple *zappa*, southern Italy presents two paradoxes: much perfectly good Byzantine work had been produced outside Byzantine Italy, in, for example, Monte Cassino; and the influence and

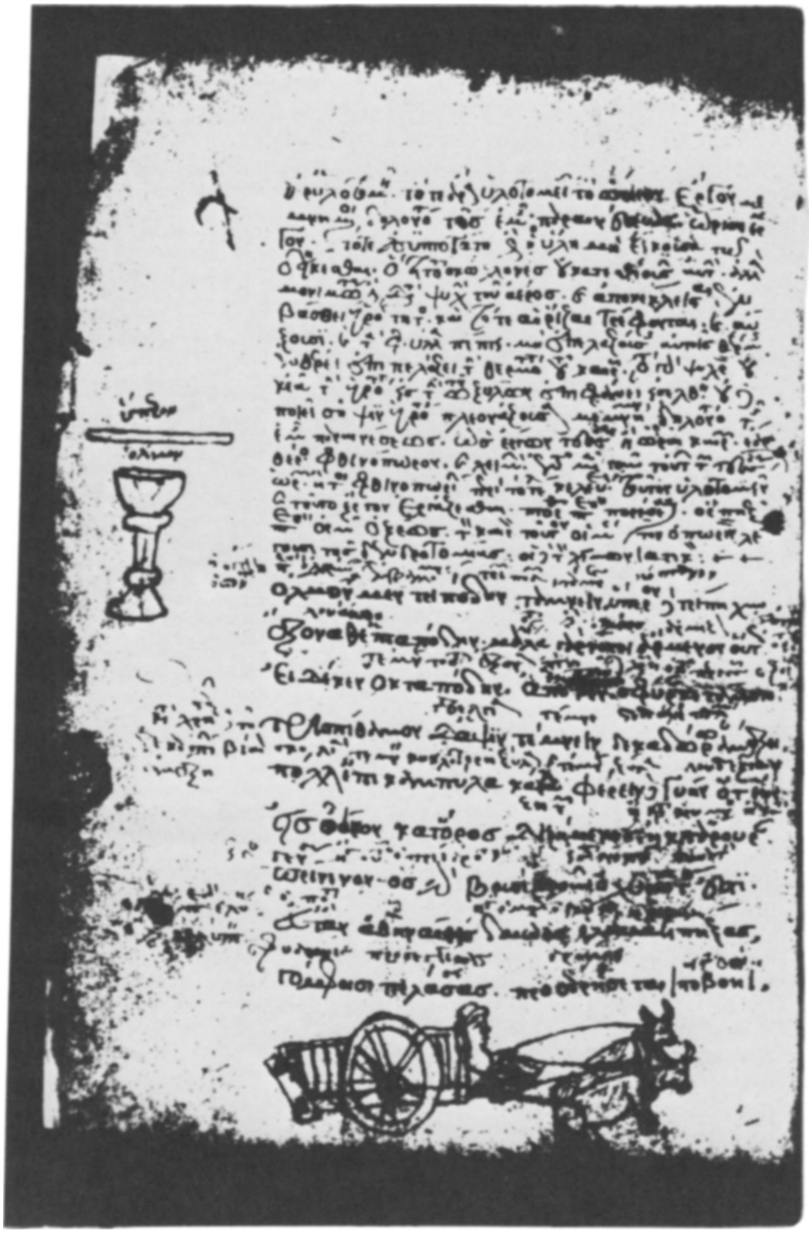

FIG. 8. Illustrator V. Yale 254 f. 67^{v}

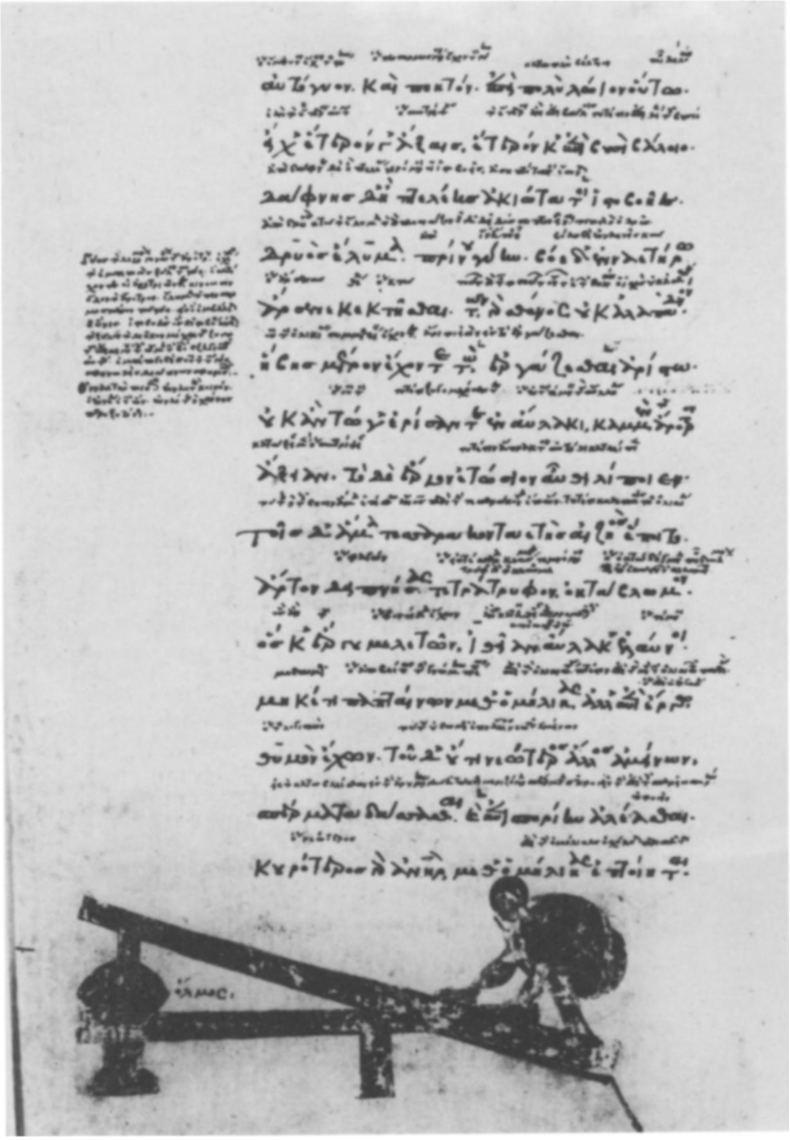

FIG. 9. Illustrator VI (Triklinios). Marc. gr. 464 f. 33^{v}

patronage of Byzantine monasteries there only became important after the end of Byzantine rule in its last Italian toe-hold in 1071.[56] An antiquarian Italian 'Byzantine' context for the ϕ manuscripts after 1071 therefore remains possible, without even bringing in Norman Sicily. But apart from the yellow ochre in FIG. 5, these late illustrations alone make me question the Italian connection proposed for this family, especially for the fourteenth-century manuscripts VIII and XI.

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[56] H. Belting, 'Byzantine Art Among Greeks and Latins in Southern Italy', *DOPapers* 28 (1974) 1–30.

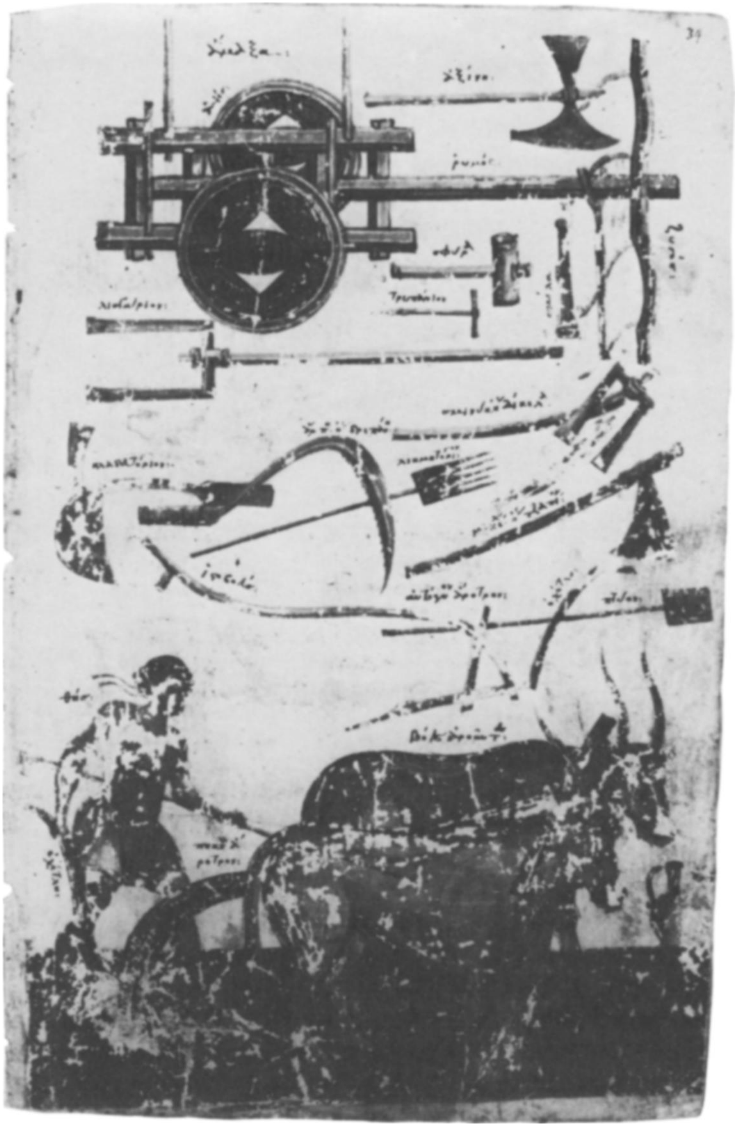

FIG. 10. Illustrator VI (Triklinios). Marc. gr. 464 f. 34r

Such questions argue for the 'realism' of the drawings of our tools, particularly those in the remaining manuscripts, which are more or less maverick in their illustrations:

I. Paris. gr. 2771, mid-late tenth century (FIGS. 3-4). The influential C, representing a lost hyparchetype Ω, and the earliest known illustrated Hesiod, the schematic and marginal illustrations of which hint at an earlier basic model. Yet it does not seem to have transmitted the tradition to younger members of the ω family (FIGS. 3-4).[57]

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[57] West, 79-80.

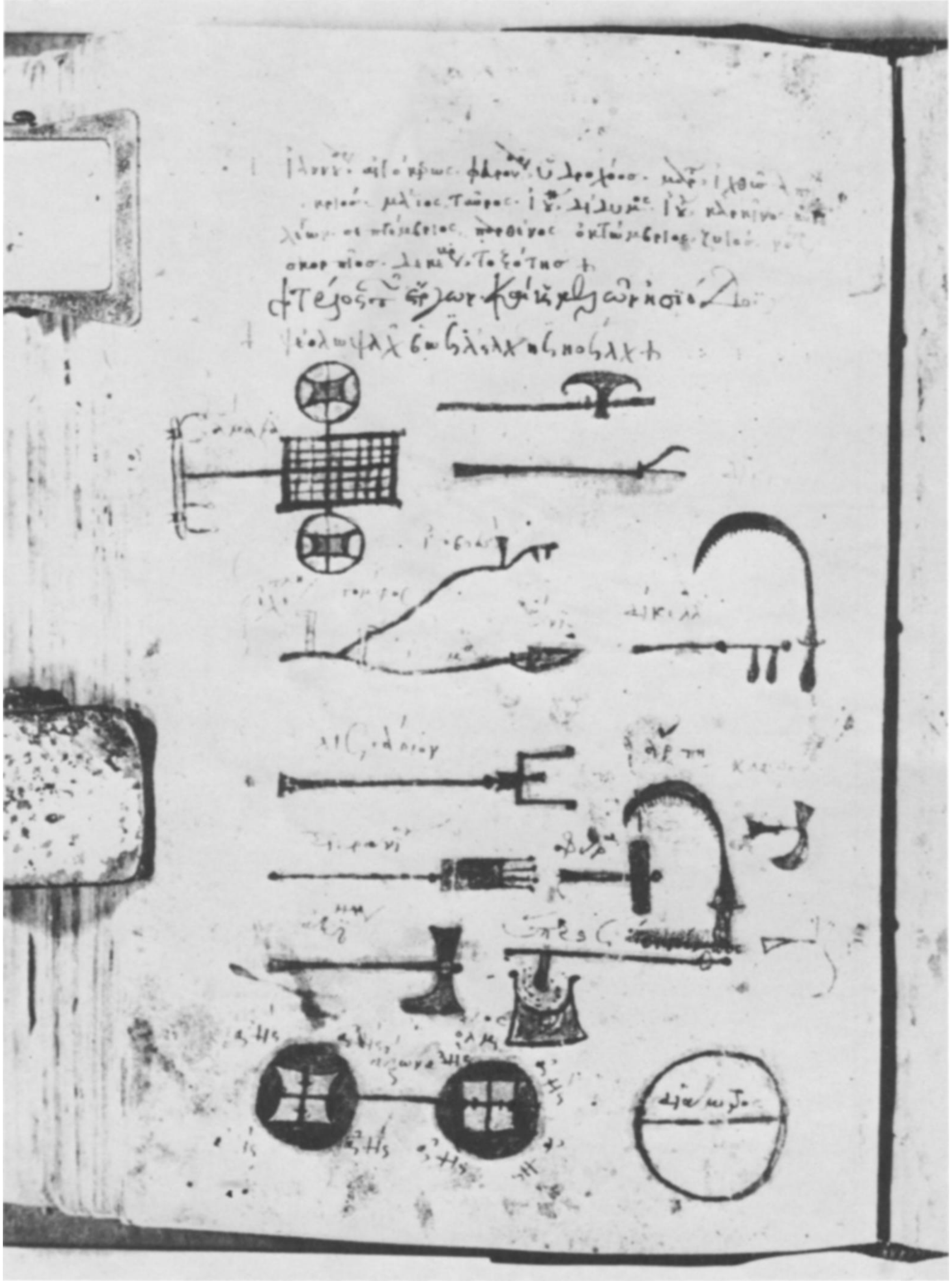

Fig. 11. Illustrator VII. Ferrar. Ariost. II 155, f. 113^{v}

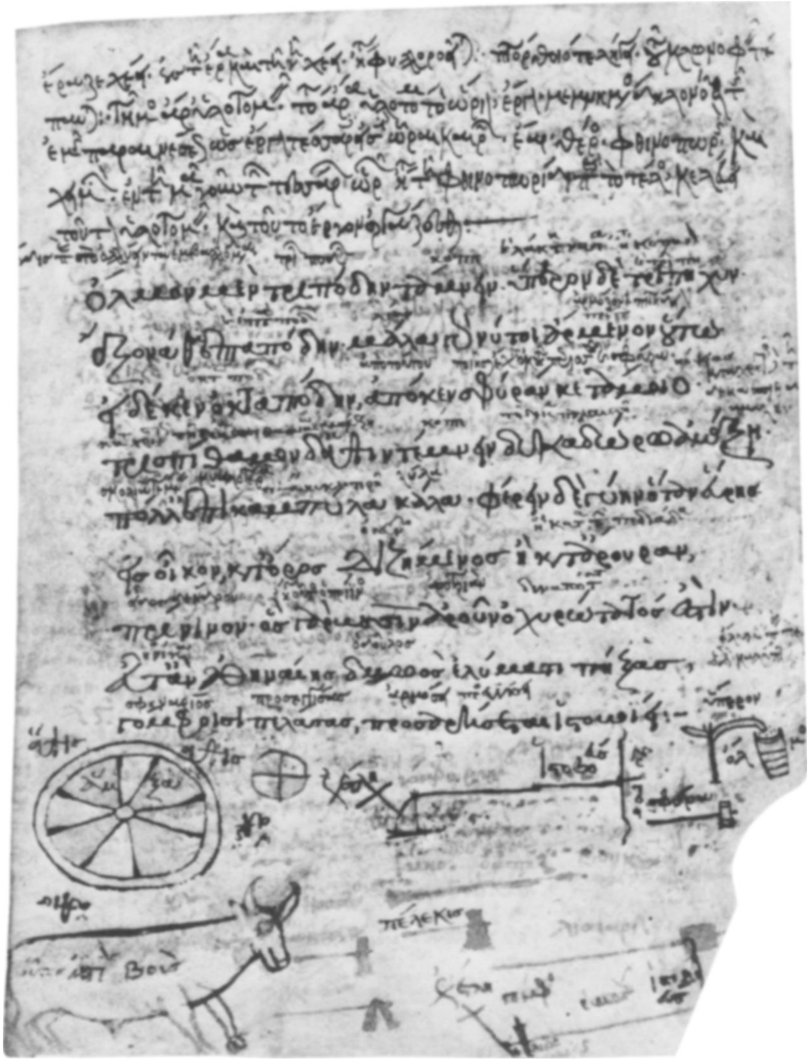

FIG. 12. Illustrator VIII. Paris. gr. 2773 f. 59^{v}

VI. Marc. gr. 464 is the autograph of Demetrios Triklinios, 'the first genuine critic produced by the middle ages',[58] finished on 20 August 1316. The labels to the implements in FIGS. 9 and 10 seem to belong to his addition of Tzetzes's scholia before 1319 but the whole page on f. 33^{r} was set aside for illumination in the original plan for the book. Complementing Triklinios's calligraphy, the drawings may not be his own, but Triklinios is certainly responsible for their quality. They are the most impressive, informative, and 'realistic' evidence for Byzantine ironmongery we have.[59]

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[58] Wilson, 249.

[59] West, 82–3; Furlan, iv. 25–7 pl. 4 (the plough in our FIG. 10, in colour) figs. 17–19; Turyn, *Dated Greek Manuscripts of the Thirteenth and Fourteenth Centuries in the Libraries of Italy* (Urbana–Chicago–London 1972).

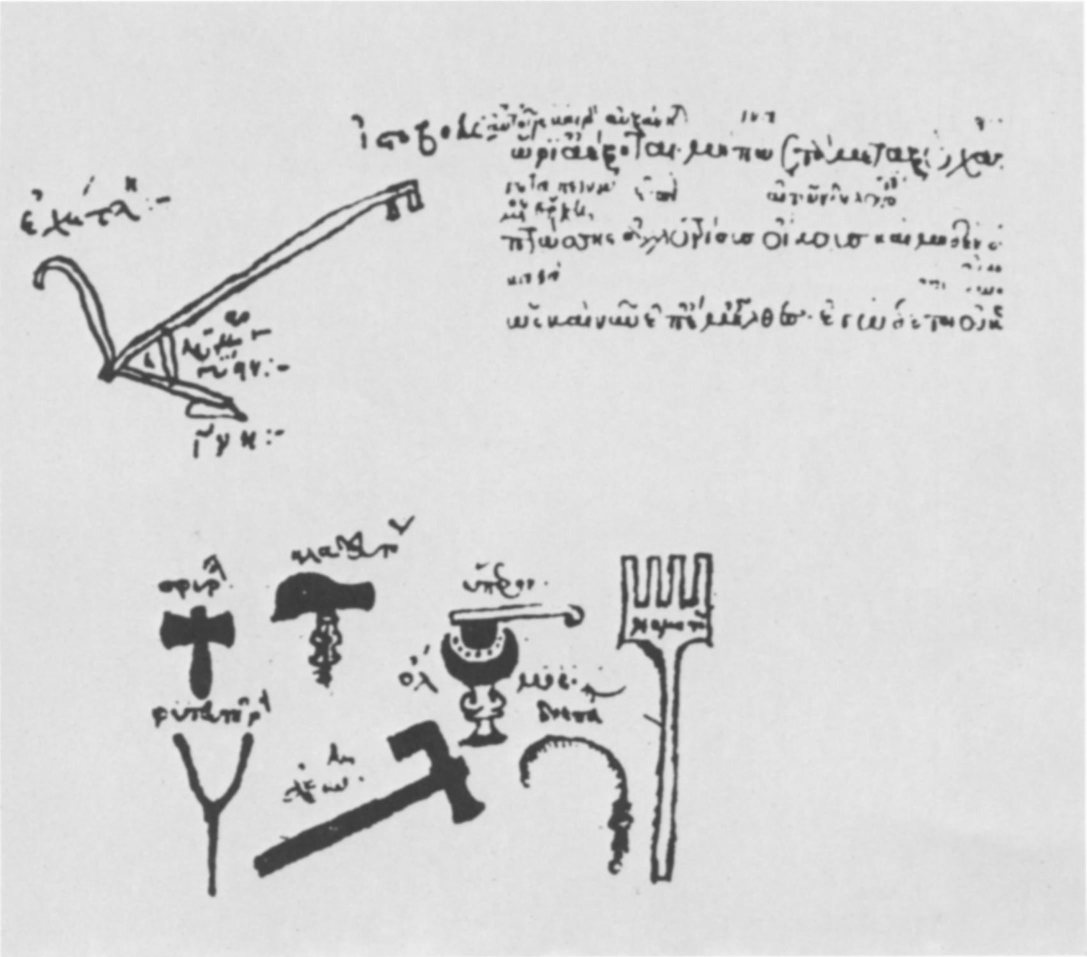

FIG. 13. Illustrator IX. Marc. gr. 466 f. 77^{v}

VII. Ferrar. Ariost. II 155 (together with some farouche hunting scenes, apparently not connected with Ps.-Oppian and not reproduced here) (FIG. 11).

IX. Marc. gr. 466, fourteenth century (FIG. 14).[60]

XII. Paris. gr. 2763, fifteenth century, with only a schematic plough, not reproduced.

XIII. Vindob. phil. gr. 256, fifteenth century (FIG. 16).[61]

XIV. Paris. gr. 2776, sixteenth century, with only a schematic plough and wheel, not reproduced.

Manuscripts VI, VII, IX, X, and XIII must offer the most 'realistic' pictures of late Byzantine implements not named in Hesiod or the early scholiasts in group B. But all illustrations reproduced in FIGS. 3–16 reflect more or less a Byzantine present, rather than the unimaginably distant past of the *Works and Days*. These drawings are, indeed, our most vivid evidence for Byzantine agricultural implements. But they may not represent the most common

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[60] Furlan, iv. fig. 20.

[61] O. Mazal, *Byzanz und das Abendland* (Vienna 1981) 367–8 pl. 76

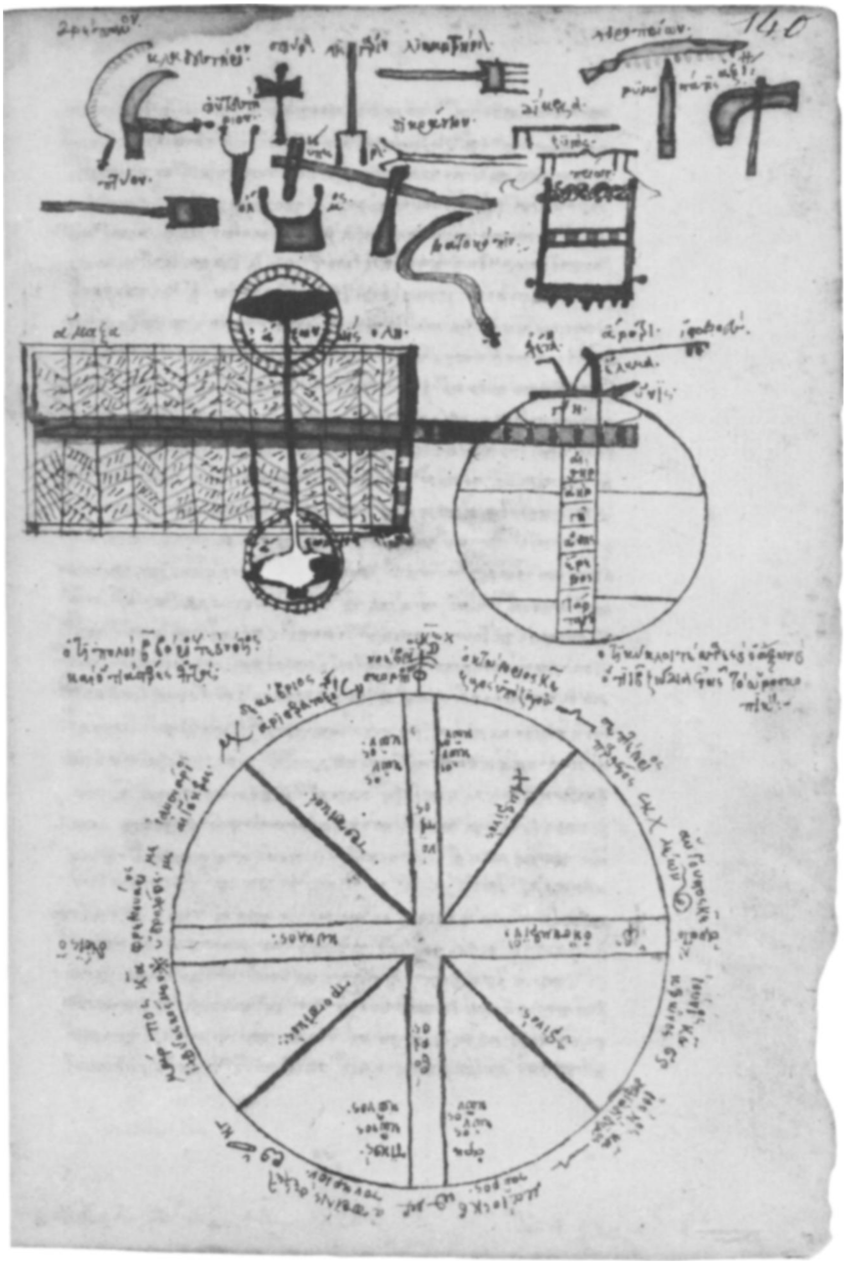

Fig. 14. Illustrator X. Paris. gr. 2786 f. 140^r

implements. First, Hesiod naturally chose to explain the two most complex machines of his time: the wheeled cart and soleard plough. That, centuries later, such means of transport and tillage were still not the primary Byzantine ones is suggested by medieval wills and modern Pontic practice. In the mountains behind Trebizond most carriage was on the backs of beasts and women until it was very recently replaced by lorry and *dolmuş*: the Hesiodic cart was hardly given its day in the process of road-blasting. Tillage remains primarily by mattock, hoe, and the *bel* 'spade-fork' in FIGS. 17–19 because it is hard to see either the Hesiodic or modern plough making much headway in such terrain. Secondly, this article is confined to those tools of which there is some kind of Byzantine Hesiod illustration. Among documentary sources, the *Skaranos Will* offers, for a start, a number of tools for which we have a name but no picture. Among what should be growing archaeological evidence, the Romanians offer pictures of implements for which we have no name. It is a good field for further research.

An inventory of illustrated implements, which is strictly limited to my Byzantine Hesiodic terms of reference, follows.

A. IMPLEMENTS NAMED IN TEXTS OF *WD* OR *SV* (see Table on p. 67)

A.1. *ΟΛΜΟΣ/ΥΠΕΡΟΝ* (*ΚΟΠΑΝΟΝ*)/*mortar and pestle*

Hesiod specified a 3-ft wooden mortar (a hollowed trunk) and a 3-ft wooden pestle (presumably held vertically). But only V (FIG. 8) shows a simple pestle. All others introduce a horizontal bar with head, which rocks on an axis, most elaborately in VI (FIG. 9). The mortar is shown conventionally in section, sometimes with an indication of the pulse or grain which is pounded in it.

Too minor to appear in wills, a survival of the simpler kind is in Bryer, *CS* vii. 412 and fig. 27 (stone mortar, wooden T-shaped pestle).

A.2. *ΣΦΥΡΑ/mallet*

A plain wooden two-headed mallet: *σφηρέα* in *Skaranos Will*, 80; cf. Benaki, pl. 6.

A.3. *ΑΜΑΞΑ/cart* and parts: *ΑΞΟΝΑ/axle*; *ΑΨΙΣ/felloe*; add *ΖΥΓΟΝ/yoke*

Hesiod's instructions for cutting timber for a cart have puzzled ancient and modern commentators, most recently West, *WD*, 264–6; and N. J. Richardson and S. Piggott, 'Hesiod's Wagon: Text and Technology', *JHS* 102 (1982) 225–9. Byzantine illustrators were evidently puzzled too, but offer what looks like common sense. All agree that it is a two-wheel cart, not a four-wheel wagon, which is in question; and Illustrators III, VI, and VIII make it clear by their labelling that they regarded the *apsis* as a quarter-felloe. They evidently inherited a schematic interpretation of the text, which supplied simply an axle and two wheels (e.g. IV, VII, VIII, XI, and XIV). Quarter-felloes lend themselves to radial spokes, logically in multiples of four, such as the modern Skyran twelve-spoke wheels in Cheetham, Thesis, pl. 1. There are five-spoke wheel sports, perhaps in XI, probably in the waggon rick in which some Children of Israel are unhappily perched in the Khludov Psalter, and certainly in the wheel of the chariot on the current £5 sterling bank note, which reveals the distance between reality and model. But Illustrator XIII keeps to four spokes; V has six; III and VII four or eight; XIV has eight; and IV and X even more. Yet, however refined the Hesiodic wheel may have been, the fact is that a second type, the disc wheel, is easier to make and more suited to heavy work. Still common in southern Albania and Yugoslavia, the disc wheel has no rival in central and eastern Anatolia south of the Pontic Alps, including the modern area of Sykeon: cf. A. J. Festugière, *Vie de Théodore*

See left
TABLE OF TEXTS LISTING IMPLEMENTS
(numbered in Inventory and Wills)

See right
TABLE OF ILLUSTRATED BYZANTINE MANUSCRIPTS OF HESIOD Works and Days (WD) WITH Scholia Vetera (SV), referring to West's (WD) and Pertusi's (SV) editions by line. Sigla:

X = illustrated agricultural implement
✱ = illustrated and labelled implement
+ = labelled but not illustrated implement
() = incomplete illustration or label

MANUSCRIPTS, WD REFERENCES DATES AND FIGURE NUMBERS

A 'Farmer's Law' 'Νόμος γεωργικός' 7th century	B Constantine VII's edition of Geoponica. 10th century	C Inventory of Xylourgou mon. for Pantaleimon mon. Athos. A.D. 1142	D Will of Monk Gerontios to St Marina monastery, nr. Smyrna. A.D. 1192	E Will of George Melissenos for Lembo mon., nr. Smyrna. A.D. 1284	F Will of Kalana Spelianitopoulos to Vazelon mon. Pontos. 13th century	G Will of Monk Theodoulos Skaranos to Xeropotamou mon., Athos. Ca. 1270-74	A IMPLEMENTS NAMED IN TEXTS OF WD OR SV	I Paris gr. 1771 f22^{r-v} WD 419-34. West C (Ω). Mid-late 10th c. Figures 3-4	II Vat. gr. 2383 f.62^v WD 428-31. West φ3 A.D. 1287. Figure 5	III Cantab. Trin. 0.9.27 f.44^v. WD 424-31. West φ4 13th century. Figure 6	IV Paris gr. 2774 f.36^v WD 415-26. West ψ11 ca.1300. Figure 7	V Yale 254 ff.67^v, 69^v WD 423-31, 432-38 West φ5. A.D. 1301.Fig. 8	VI Marc. gr. 464 ff.33^v-34^r.WD 433-47.Triklinios A.D. 1316. Figures 9 & 10	VII Ferrar. Ariost. II 155 ff.113^v-114^r. WD end A.D. 1337. Figure 11	VIII Paris. gr. 2773 f.59^v WD 423-31. West φ8. 14th century. Figure 12	IX Marc. gr. 466 f.77^v 14th century. WD ?end Figure 13	X Paris. gr. 2786 f.140^r WD end. 14th century. Figure 14	XI Vat. Ottob. gr.210 f.42^v. WD 432-39. West φ10. A.D. 1363. Fig. 15	XII Paris. gr. 2763 f.157^v WD 411-33. 15th century Not illustrated here	XIII Vindob. phil. gr. 256 f.19^v. WD 383-86. 15th c. Fig. 16	XIV Paris. gr. 2776 f.26^r. WD 430-35. 16th c. Not illustrated here.
–	–	–	–	–	–	–	1.ὅλμος/mortar; ὕπερον/pestle: WD 423 κόπανον/pestle: SV 423	✱	–	✱ two	✱	✱	✱	✱	✱	✱	✱	–	–	✱	–
–	–	–	–	–	–	1	2.σφῦρα/mallet: WD 425	✱	–	✱	✱	–	✱	✱	✱	✱	✱	–	–	✱	–
–	–	–	–	1 ἁμάξιν	–	–	3.ἄξονα/axle; ἀψίς/felloe; ἅμαξα/cart: WD & SV 424-26. Add ζυγόν/yoke	–	(✱)	(✱)	(X)	(✱)	(✱)	(✱)	(+)	–	(✱)	(X)	–	(X)	(✱)
–	–	4 ὔνια	–	2 ὑννία	1 ζυνη	2 ὑννία	4.γύης/plough-beam; ἱστοβοεύς/yoke-beam; ἐχέτλη/stilt; ἔλυμα/sole: WD 427, 430-36, 467. ὕνις/plough-share: SV 427-30	✱	(✱)	✱ two	✱ two	✱	✱ two	✱	✱	(✱) two	✱	(✱) two	✱	✱	✱
–	–	–	–	–	–	–	5.ὅρπηξ: WD 468.βούκεντρον/goad: SV 468	–	✱	–	✱	–	X	–	✱	–	–	–	–	–	–
–	–	10 τ	5 τζ	–	–	2 τζ	6.μακέλη/mattock: WD 470 (τζάπιον)	–	(✱)	✱	–	–	✱/+	–	✱	–	–	✱	–	–	–
							B IMPLEMENTS NOT NAMED IN WD OR SV														
+	+	15	–	–	–	2	1.δικέλλι(ον)/two-pronged drag-hoe	✱	–	✱	✱	–	✱	✱ two	✱	–	✱	✱	–	✱	–
λίσγου	–	1	3	2	1	–	2.λισγάρι(ον)/'spade-fork'	–	–	–	✱	–	✱	✱	(✱)	–	✱	–	–	–	–
+	+	1	–	–	–	μέγα	3.πέλεκυς/double-bladed hatchet	–	–	✱	–	–	–	X	✱	–	–	–	–	–	–
–	+	–	2	2	–	–	4.ἀξίνη/pick-axe	–	–	–	✱	–	✱	✱	–	✱	✱	–	–	✱	–
+	+	4	8	–	2	2+2	5.δρέπανον/sickle	–	–	–	✱	–	✱	(✱) 2	–	✱	✱	–	–	✱	–
–	–	–	–	–	–	1	6.βατοκόπιν/bramble-slasher	–	–	–	–	–	–	–	–	–	✱	–	–	–	–
+	–	6	2	–	–	1	7.κλαδευτήριον/vine-dresser's knife	–	–	–	–	–	✱	✱ 2	–	✱	✱	–	–	✱	–
–	–	–	–	–	–	–	8.φυτευτήριον/vine fork	–	–	–	–	–	–	–	–	✱	✱	–	–	✱	–
–	–	–	–	–	–	–	9.δικράνιον/pitch-fork	–	–	–	–	–	–	–	–	–	✱	–	–	–	–
–	–	–	–	–	–	–	10.λικμητήριον/winnowing fork	–	–	–	–	–	✱	(✱)	–	✱	✱	–	–	✱	–
–	–	–	–	–	–	–	11.πτύον/winnowing shovel	–	–	–	–	–	✱	–	–	–	✱	–	–	–	–
–	πρίων	–	1 π.	–	–	2 π.	12.πρίων/frame-saw;13.χειροπρίων/hand-saw	–	–	–	–	–	–	–	–	–	✱/✱	–	–	–	–
–	–	–	μέγα	–	–	–	14.τρυπάνιον/auger	–	–	–	–	–	✱	–	–	–	–	–	–	–	–
–	–	–	4	–	–	–	15.σμίλα/chisel	–	–	–	–	–	✱	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	16.ρυμοστάτης	–	–	–	–	–	–	–	–	–	✱	–	–	–	–
–	–	–	–	–	–	2	17.τυκάνη; δο(υ)κανή/threshing sledge	–	–	–	–	–	–	–	–	–	–	–	–	✱	–

de Sykéon (Paris 1970) 79. Made of segmented boards, Anatolian solid wheels are now iron-rimmed. Their diameters are 1.0–1.2 m, and axles about 1.6 m (FIG. 2), falling into Richardson's and Piggott's rough scale for the Hesiodic cart. Today the axle carries a V-shaped frame at its legs, which culminates in a double yoke across its tip. G. K. Chatzopoulos gives detailed instructions on how to build such a cart in *῾Η ἅμαξα εἰς τόν Πόντον*, *Ἀρχεῖον Πόντου* 33 (1975–6) 35–60; it is illustrated in Bryer, *CS* vii figs. 8, 11. The chassis is stable, but can chafe oxen and wheels; the latter screech if not greased. However, Byzantine illustrators II, III, V, VI, VII, X, and XIII make it clear that a single (and so less stable) shaft ran from axle to yoke of their carts. Illustrators II, III, V, and XIII added a rick, as in FIG. 2.

Whether spoked or disc wheels were in fact more familiar to them, most Byzantine illustrators remained faithful to Hesiod's text in giving carts quarter-felloes and consequently spokes. Disc wheels *may*, however, appear in II and X (seen from above).

A third and most interesting kind of wheel is shown by two illustrators: VI (Triklinios) and VII (twice). Here the quarter-felloes frame four truncated quadrants which leave a square opening in the centre of the wheel into which an oval block, through which the axle runs, is wedged, so that any turn of the wheel locks it tighter. Triklinios's wheel is the most closely observed. Drawn with a compass, it shows no break in the quarter-felloes (which would have been staggered against the quadrants). Perhaps an iron rim is intended. I can find no clear precedent or survival. Was this neat, yet sturdy, design the Byzantine contribution to the technology of the wheel?

A.4. *ΓΥΗΣ/plough-beam* and other parts: *ΙΣΤΟΒΟΕΥΣ/yoke-beam*; *ΕΧΕΤΛΗ/stilt*; *ΕΛΥΜΑ/sole*; finally *ΥΝΙΣ/plough-share*.

Of illustrators of the plough and its parts, only VI and XI attempt to elaborate on a schematic plough. It is, strictly speaking, the sole ard of White, 123–45; no other is known. But a post-Hesiodic addition is the *hynis* share, apparently of iron, named in some wills and depicted by V, IX, X, and XII; and perhaps in II, IV, and the 1346 Labours of the Months; cf. Koukoules, *BBP* v. 254–6; Mouriki, pl. 89. *Dinogetia*, 265, has yielded a share.

This basic, universal and much discussed sole ard needs no further commentary save that it was in 1985 still flourishing in Anatolian terrain best suited to it, where deeper shares would have led to erosion of thin topsoils. Among survivals: Smith, *Chios*, fig. 116; Cheetham, Thesis 4–6 fig. 2.2–2.4 pl. ii; Benaki, pl. 7; and Bryer, *CS* vii 396–98 figs. 2–6.

A.5. *ΟΡΠΗΞ/wand*; *ΒΟΥΚΕΝΤΡΟΝ/goad*

The ploughman's essential accessory: a long wooden stick, wielded in the left hand, to goad beasts from behind in their most tender parts; cf. Koukoules, *BBP* v. 256 n. 6. Survival is universal, e.g. in Bryer, *CS* vii figs. 2, 4.

A.6. *ΜΑΚΕΛΗ* (*ΜΑΚΕΛΛΑ* = *ΤΖΑΠΙΟΝ*)/*mattock*

White, 36, writes: 'Few of the dictionaries give any help in sorting out the implements of this class: "a sort of hoe" is the common resort of ignorance.' Our Byzantine illustrators seem to have been equally at sea, and the order I have imposed may be artificial.

Hesiod, *WD* 470, describes the then function of the *μακέλη*: 'And let a young slave follow behind [the plough] with a *makele* and cause trouble to the birds by covering up the seed.' In Pontic Greek the word survived as *μακέλ*(*λιν*) to describe a plain iron hoe fixed at right angles to a wooden haft; the Pontic survival in Demarchos and Kapnas fig. 38 corresponds with the Benaki's examples of *tsap*(*i*)*a*, pls. 88, 131, mattocks; and Triklinios clearly identifies the two

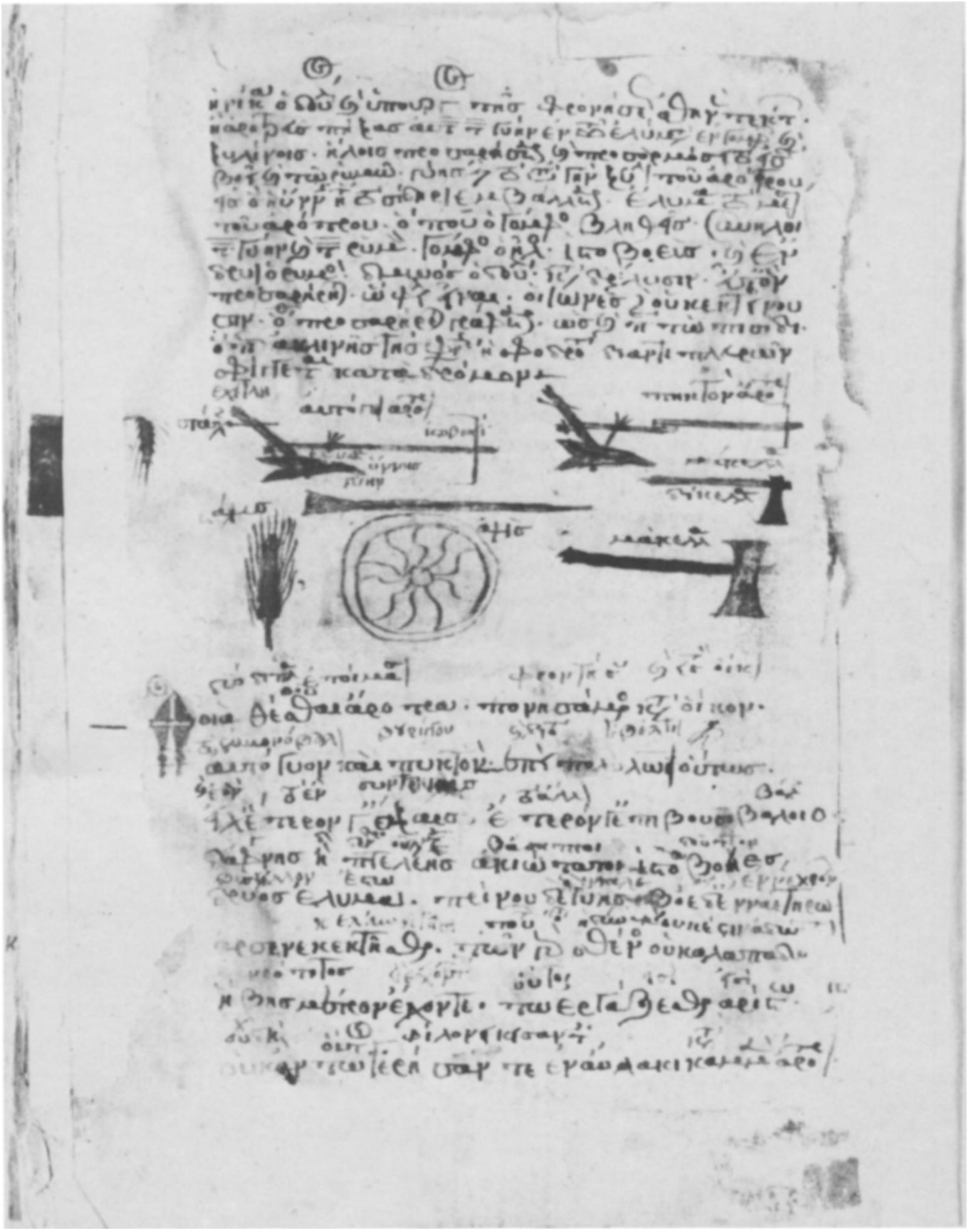

FIG. 15. Illustrator XI. Vat. Ottob. gr. 210 f. 42ᵛ

terms in FIG. 10. Cf. Smith, *Chios* 47 and pl. 116 fig. 7; Spinei, figs. 12, 13; Koukoules, *BBP* v. 269. I have therefore taken this implement, the only hoe named in Hesiod, to be the equivalent of its modern survivals, basically the Latin *ligo* and Italian *zappa* mattock, as opposed to the *bidens* two-pronged drag-hoe, which the wills show to have been rather commoner. The distinction between the two kinds of tool, and their basically similar function, is recognized by the compiler of the Patmos *praktikon*, who envisaged the clearance of 467 *modioi* with mattock *and* hoe, *σκαπάνης καὶ δικέλλης*, to make the island fit for cultivation: Miklosich and Müller, *Acta et diplomata* vi. 57.

Other confusions are that our Illustrators III, VII, and XI do not attempt to show the implement three-dimensionally (the blade of Illustrator II in FIG. 5 is cropped). Triklinios comes to the rescue again in FIG. 10, not only by attempting to show the blade's angle to the haft, but clearly distinguishing the *makella-tzapion* from the *dikella*—although his mattock is slightly split at its blade, as in White, fig. 19. This split is more emphasized by Illustrator VII, who, however, also distinguishes it from the *dikella*. But Illustrators III and XI present a *makella* which looks like a two-dimensional double-edged implement, almost a Varangian hoe. However, Illustrator III's depictions of a mallet, hatchet, and *makella* are near identical, while Illustrator XI thought better of his original label for the *makella*, crossed it out, named an axe-like implement *dikella* and gave the name *makella* to a two-headed affair below. Not perhaps the most reliable of witnesses, maybe they had not, with Triklinios, realized that Hesiod's *makele* was then the *tzapion*.

B. IMPLEMENTS NOT NAMED IN THE TEXT OF *WD* OR *SV* (see Table on p. 67)

B.1. *ΔΙΚΕΛΛΑ ΔΙΚΕΛΛΙ(ΟΝ)/two-pronged drag-hoe*

This common twin-tined hoe was particularly employed in vineyards. White, 50, distinguishes two basic types, reflected here. Illustrators I, IV, VI (as usual, the best observed), and XIII have heavy hoes, dragged horizontally. Illustrators VII, VIII, and X have lighter implements, which bite into the soil. Illustrators III and XI are unsure of themselves, XI demonstrably so. Triklinios (VI) learnedly equates his *dikelli(on)* with the classical *σμινύη*; it is Pontic *τζακέλιν*, according to Papadopoulos from Latin *sarculum*, but more commonly the *bidens*: there is a probably Roman example in the Polytechnic Museum, Athens—White, 51 and figs. 27, 29; cf. Koukoules, *BBP* v. 269, 285; Nesbitt, Thesis 112. The finest Byzantine illustration is in the fifth- to sixth-century mosaic in *The Great Palace of the Emperors*, 2nd report, ed. D. Talbot Rice (Edinburgh 1958) pl. 47 (now sadly degraded). An eleventh- to twelfth-century ivory in the Olivieri Museum, Pesaro, shows Adam delving with a splayed *dikella*: Schlumberger, *L'Épopée* iii. 21. Among survivals, see Benaki, pls. 89, 90; and Smith, *Chios* 47 pl. 116 figs. 9, 10 (light hoes).

B.2. *ΛΙΣΓΑΡΙ(ΟΝ)/'spade-fork'*

In the absence of an iron spade (unless it is in FIG. 12 by the uncertain Illustrator VIII), Illustrators IV (FIG. 7), VI (FIG. 10, Triklinios), VII (FIG. 11), and X (FIG. 14) show a *Π*-shaped implement where the wooden shaft runs through a socket between the widely spaced tines.

There are two main etymological threads: first the *λισγάριον* of the scholia to Theocritus, 4. 10, of the Farmer's Law, and equated with the *σκαφείον/σκαπάνη* mattock in the Suda, which becomes the Modern Greek *λισγάρι* rake or harrow: *lisgarion* is the label given to our Hesiodic illustrations, as Schilbach, 37, points out, a diminutive of *λίσγος*. The second thread is through the even earlier attested *λίστρον* or leveller, with which Telemachus scraped the floor of the remains of the massacred Suitors in *Od.* xxii. 455. In a land of etymological as well as agricultural survivals, Papadopoulos links the Pontic (*ἐ*)*λίχτρε* to the *λίστρον*. It is the *ἐλίκτριν* of the

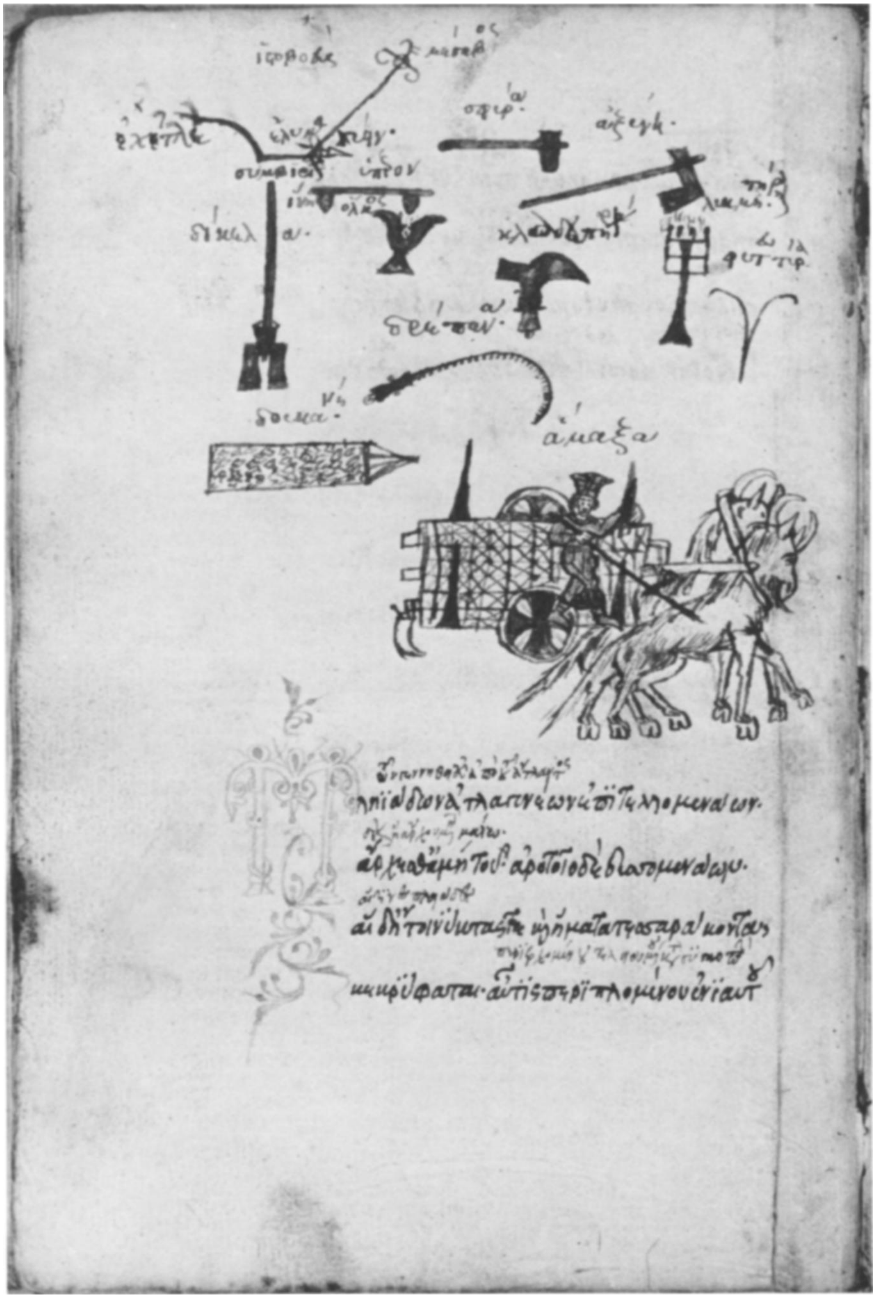

FIG. 16. Illustrator XIII Vindob. phil. gr. 256 f. 19^{v}

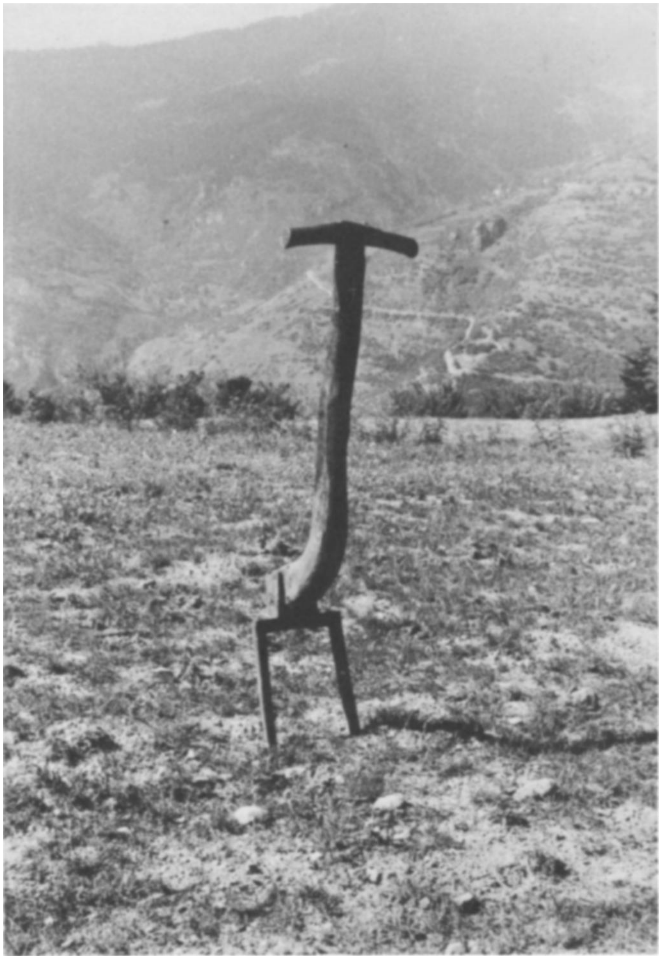

FIG. 17. Pontic *lichtre* (*bel*), Hortokop

Spelianatopoulos Will, and called *λίχτρα*, *λιχτρομάκελλον*, in Stavri: *Ἀρχεῖον Πόντου* 16 (1951) 228—a summer village, now Istavri or Uğurtaşı, where the implement was still being wielded to dig potatoes in 1985. Here it is just called Turkish *bel*; if the Greek name survives, it must probably be sought in Of or Tonya. Pontic Turks adopted the implement after 1461. However, the earliest recorded use they put it to was as an instrument of murder, when Tamam bint Abdi, wife of Rustem, was felled by two blows of the *çatal* in Kousera, Lower Matzouka, in 1638: R. Jennings, 'The Society and Economy of Maçuka in the Ottoman Judicial Registers of Trabzon, 1560-1640', in *Continuity and Change in Late Byzantine and Early Ottoman Society*, ed. A. Bryer and H. Lowry (Birmingham 1986) (151).

The tool may possibly be represented by a tine in *Păcuiul lui Soare* ii fig. 16.2, but does not seem to survive recognizably except in the Pontos. Here commentators from Procopius onwards have remarked on the primitive millet, *lazut*, cultivated in valleys too steep for ploughs to reach (although Kalana Spelianatopoulos had both plough and *eliktrin* in her part of Matzouka). A commonplace traveller's tale is that farmers have to rope themselves to trees to use their spade-forks. For example, Procopius, *Wars* I. xii. 16: '. . . neither corn nor wine nor any other good thing is produced there. Nor indeed can anything be carried in from elsewhere on account of the narrowness of the paths, unless it be carried by men. However, the Lazoi were able to live on a certain kind of millet which grows there, since they were accustomed to it.' In 1835 Brant noted of Sürmene: 'The country is so wooded and mountainous, that it does not produce grain sufficient for the consumption of the population, yet not a spot capable of cultivation appears to be left untilled. Corn fields are to be seen hanging on the precipitous sides of mountains, at which no plough can arrive. The ground is prepared by manual labour, a two-pronged fork, of a construction peculiar to the country, being used for this purpose': see A. Bryer and D. Winfield, *The Byzantine Monuments and Topography of the Pontos* i (Washington DC 1985) 323. Papadopoulos, s.v. *λιχτρεύω*, even preserves a two-line digging ballad:

'Επέρα λιχτρομάκελλον κ' ἐγὼ 's σὸν ᾈδ' ἐπῆγα,
ἐλίχτρεψα κ' ἐγρίζεψα καὶ τὴν ἀγάπη μ' εὗρα.

The main difference between the *lisgarion* of the Hesiodic illustrators and our surviving *listron* is that the former appears to be straight (see VI in FIG. 10), while the modern one has a pronounced forward-curving shaft (see FIGS. 17–19). This provides a heel which is trodden by the digger, as in FIG. 18; the drawing from Pontic folk memory reproduced in Bryer, *CS* vii fig. 7, which shows a digger's foot on the shoulder of the tines, is therefore misleading. The examples in FIGS. 17 and 19 have very similar measurements: the iron tines are 35–40 cm long and the haft 5–8 cm high; they are 2.0–2.5 cm wide and spaced 15–18 cm apart. The wooden shaft stands vertically 71–82 cm, tapering from top to bottom from 4–10 cm wide. But it bellies forward horizontally more than 10 cm at an angle of 45°. It is obviously a more efficient development of the *lisgarion* of the medieval illustrations, but its great weight, unsuitability in dry soil, and archaic construction may explain why what appears to be a major Trapezuntine, if not Byzantine, contribution to agriculture is dying out even in the Pontos. The example in FIG. 17 was seen at Hortokop, Maçka, 15 September 1979; in FIG. 18 at Araklı (Herakleia), Sürmene, 16 September 1979; and in FIG. 19 was made by Bayram Yazıcı for Dr Maurice Byrne, Trabzon (Trebizond) bazaar, 18 May 1981, and is now in the possession of the author.

B.3. *ΠΕΛΕΚΥΣ/double-edged hatchet*

Illustrated by III, VI, and VII, this Roman *dolabra* (White, 62–4) became the two-edged axe wielded by the Varangian guard, *πελεκυφόροι*: Anne Comnène, *Alexiade*, ed. B. Leib, i (Paris 1967) 923; *Skaranos* had a large one in his inventory. This is the formidable and destructive implement of Psalm 74: 5–6: 'They brought it crashing down, like woodmen plying their *πέλεκυν* in the forest; they ripped the carvings clean out, they smashed them with *πελέκεις* and *σφυρία*' (*NEB* and LXX). With such axes the forests of medieval Russia were assarted, until 'axe met axe': B. Grekov, *Kiev Rus* (Moscow 1959) 70–90. The psalm was echoed in the will of Eustathios Boilas in 1059, who tackled his wilderness by slashing and burning: 'the land was inaccessible to most people and unknown. I reduced it with *πελέκει* and fire, as the psalm saith': Lemerle, *Cinq Etudes* 22.

One day, having persuaded his monks that they had more vines than were good for them, St Nilos of Calabria (d. 1004) slung a *pelekys* over his shoulder and marched his flock out of church into the vineyards to cut them down: 'The event became widely known even on the Holy Mountain and in Sicily, and nobody was able to understand the reason for it: some people said the monks were drunk, others that it resulted from an outburst of temper on the part of the abbot, still others that they owned too many vines and could not cope with the work.' See

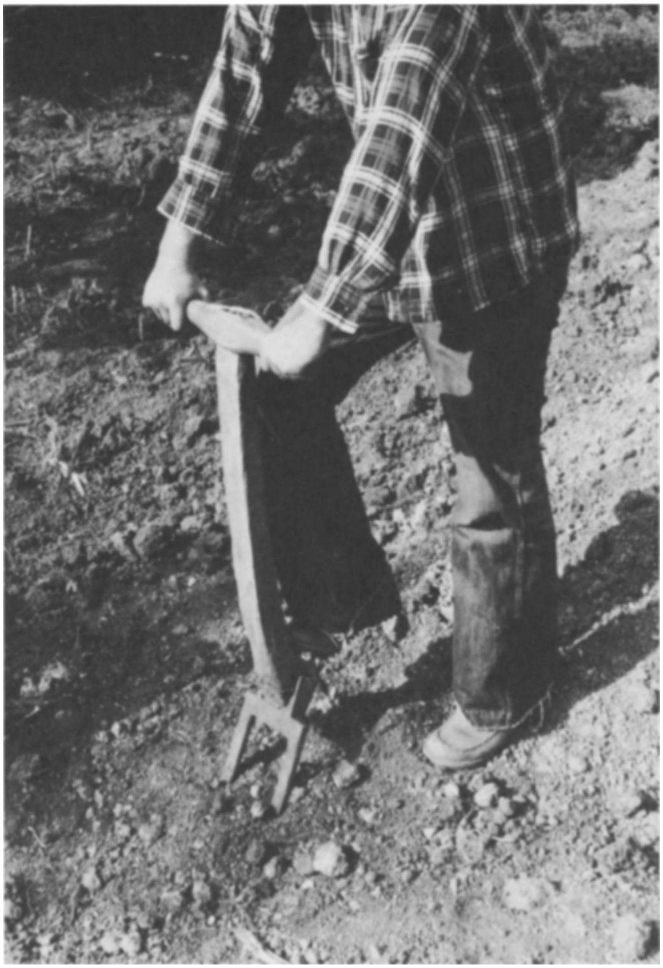

Fig. 18. Pontic *lichtre* (*bel*), Araklı

A. Guillou, 'Production and Profits in the Byzantine Province of Italy (Tenth to Eleventh Centuries): An Expanding Society', *DOPapers* 28 (1974) 92, 106. Whatever the explanation, the fact that it was a *pelekys*, which St Nilos seized upon, shows that he meant business. If he had been cultivating vines, he would have taken a *dikellion*; if pruning them a *kladeuterion*.

B.4. *ΑΞΙΝΗ/pickaxe*

The generic term for axe, and pickaxe in particular, Roman *securis*, equated by Kriaras with the *σκαπάνη* mattock. The principle is that it is single bladed, which Illustrators III, VI, VII, IX, X, and XII show could be elegantly curved, almost into a crescent, with a balancing spike. Its equivalent in the *Skaranos Will* 77, 80, appears to be the *τζικούριν*. The commonest of axes, there are two *ἀξινάρια* in the *Melissenos Will* 267. Spinei, fig. 10, has southern Moldavian archaeological evidence for it. Survival is universal: examples are in Benaki, fig. 63 (as *ἀξίνα*, a pick) and figs. 64–7 (as *τσεκούρι*, an axe). The Pontic *ἀξινάρ'* in Demarchos and Kapnas, 38, is an axe. There is a wall-painted example in Mouriki, pl. 90.

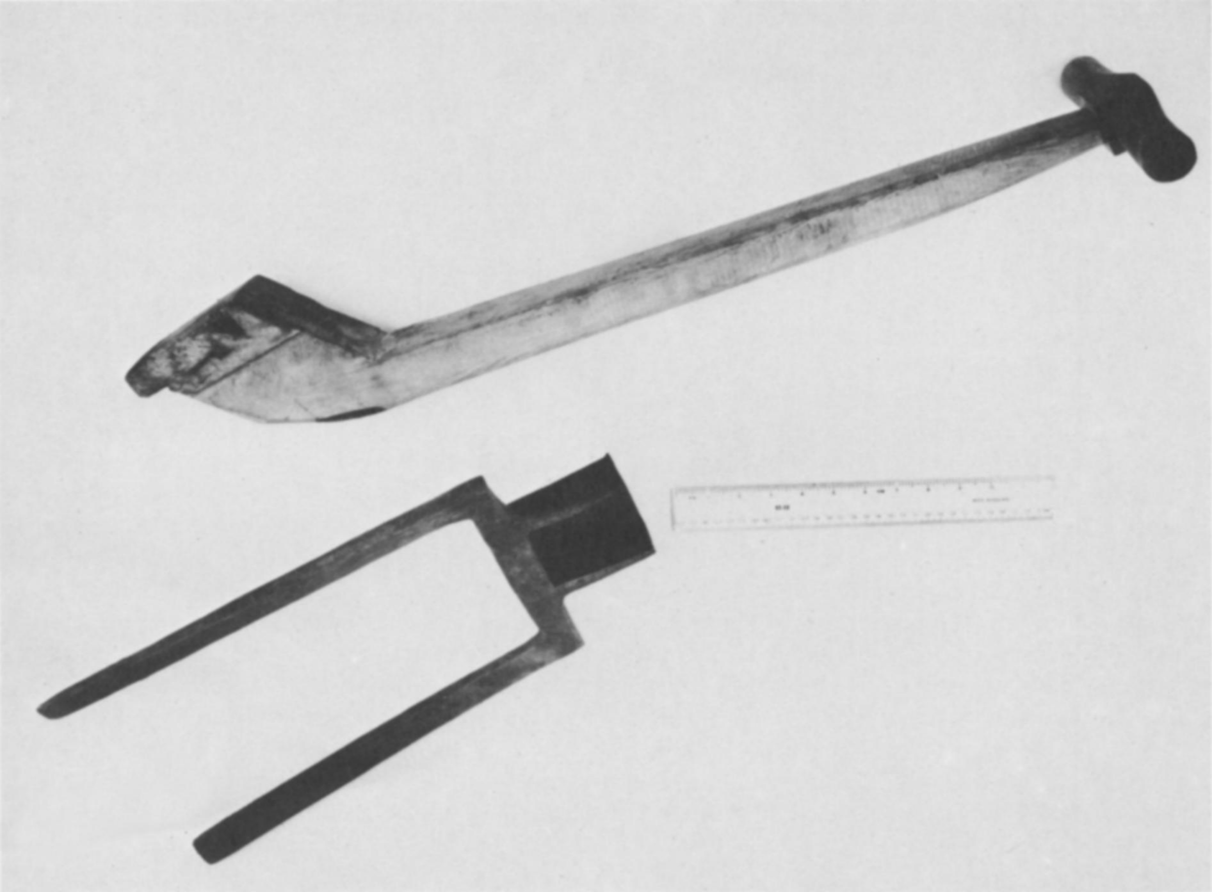

FIG. 19. Pontic *lichtre* (*bel*), Trabzon

B.5. *ΔΡΕΠΑΝΟΝ/sickle*

The universal mark of the peasant, indeed the portrait of himself as a commoner which the maverick Emperor Andronikos Komnenos (1183–5) had made on the door of the church of the Forty Martyrs showed him wearing peasant smock and boots and with the emblem of an enormous sickle (which he carried to halo the head of a handsome man). Who the latter represented is open to question. Unaccountably the sickle has also been questioned: F. Cognasso, 'Partiti politici e lotte dinastiche in Bisanzio alla morte di Manuele Comneno', *Memorie della Reale Accademia della scienze di Torino* 62 (2) (1912), 283–4, argues for a scythe; and C. M. Brand, *Byzantium Confronts the West, 1180–1204* (Cambridge Mass. 1968) 50, for a curved sword. But Nicetas Choniates, *Historia*, ed. I. Bekker (Bonn 1835), 432, names it as a δρέπανον clearly enough and there is no need to bring in Homeric comparisons to show that it was a sickle, no more, no less: F. Grabler, 'Niketas Choniates als Redner', *JÖBG* 11/12 (1962/3) 68; see now Angold, 266–7.

The Byzantine *drepanon* or reaping sickle is the Roman *falx messoria*: White, 72–85. It is common enough in the sources, although Nesbitt, Thesis 114, describes the four examples in the *Xylourgou Inventory* 56, as pruning knives.

Several sickles have been found at *Dinogetia* and one only 0.19 m long at *Păcuiul lui Soare* ii fig. 16.1. Tenth- to thirteenth-century iron sickles (with some sort of hatchet) were found at *Nemea* 162; and in Moldavia: Spinei, fig. 12.

Our Hesiodic Illustrators IV, VI, VII, IX, X, and XIII show wooden-handled sickles of the full range of curvature, but all are serrated, rather than embedded with flints, as is a wall-painted example: Mouriki, pl. 89. The serrated sickle is more efficient in drier Byzantine soils than the plain one (such as is used in the damp Pontos), which bites better when dew is on the crop: White, 80.

Still the traditional reaping tool, traditionally wielded by women: survivals abound. There is a selection of them in Benaki, fig. 20 (the largest 0.62 m), together with long-handled Kastorian sickles in fig. 21. Pontic examples are in Demarchos and Kapnas, fig. 39, and in Bryer, *CS* vii figs. 9, 10. Cheetham, Thesis fig. 2.5 has one from Yeroskepos.

The 1346 Labours of the Months for July, in Bryer, *CS* vii fig. 9, show that the reaper cut twice, first heading the corn, and then stooping to cut the straw; the heads and straw are sheafed neatly and distinctly below. This is Varro's second method: White, 81; cf. the same's 'Wheat-Farming in Roman Times', *Antiquity* 37 (1963) 207–10. In all but one of our Byzantine illustrations (Holy Sepulchre 14 f. 33^r, which has a left-handed reaper), the peasant takes the sickle in the right hand and draws a handful (Varro's *manipulus*) of corn into it with the left hand (Koukoules, *BBP* v. 260). There are two problems. The first is how to gather a neat handful, as Columella, 2. 20. 3, recognized: 'In the corn harvest they also have a little rake or comb attached to the sickle, with the help of which they lay down the stalks in so orderly a manner that it looks as if they had gathered up the bundles with their hands and laid them down' (White, 83 n. 1). In more recent times a hooked or beaked sickle has served the same purpose as this *falx veruculata*, to which White, 205–11, devotes an appendix. But there is no sign of such refinements in the Byzantine sickle. The left hand gathered, which would lead the reaper to the second problem: how to avoid slicing off her left fingers as she brought the sickle across the bunch of straw with her right hand.

Modern reapers in Macedonia, Thrace, Cappadocia, and Pontos who gather a neat bundle without losing their fingers use the ingenious wooden devices shown in FIG. 20, which both hook the corn and protect the fingers; agricultural suppliers in Trabzon itself know of them but say there is no demand because Trapezuntine peasants are smarter reapers than most. Three varieties are known to me. The first (to the left in FIG. 20) is a three-finger hooked glove, 23 cm from palm to horn, from near Kayseri (Caesarea). It dates from the 1960s and has not been used. Benaki examples, fig. 22, are 19 cm long, and less elaborate than this, where the right hole and ridge seem to be designed for the little finger of the left hand. The Benaki identifies these gloves as *παλαμαριές* and a second type as *δακτυλῆθρες*: figs. 22, 23; both names are recorded in Thrace: Koukoules, *BBP* v. 260. The latter is an index-finger thimble, an example of which is shown in the centre of our FIG. 20. The Benaki thimbles average 20 cm long; ours is 18 cm. Obtained in Macedonia, the hole in its side shows clear signs of having been made in use with a sickle. On the right of our FIG. 20 is a third variety, not represented in the Benaki: an articulated wooden glove, the four discrete fingers of which are linked by a leather thong. Much the most comfortable of these guard-hooks, it was obtained in Amasya (Amaseia) in 1985 and can presumably be assembled to fit a particular hand.

In the absence of some sort of Columellan attachment or modification to hook the corn, which would therefore have to be done in the fist, the Byzantine reaper would have required a wooden guard-hook. The present distribution of these devices in former Byzantine lands is so widespread as to suggest that it has a history, yet I find no pictorial or literary reference to this essential

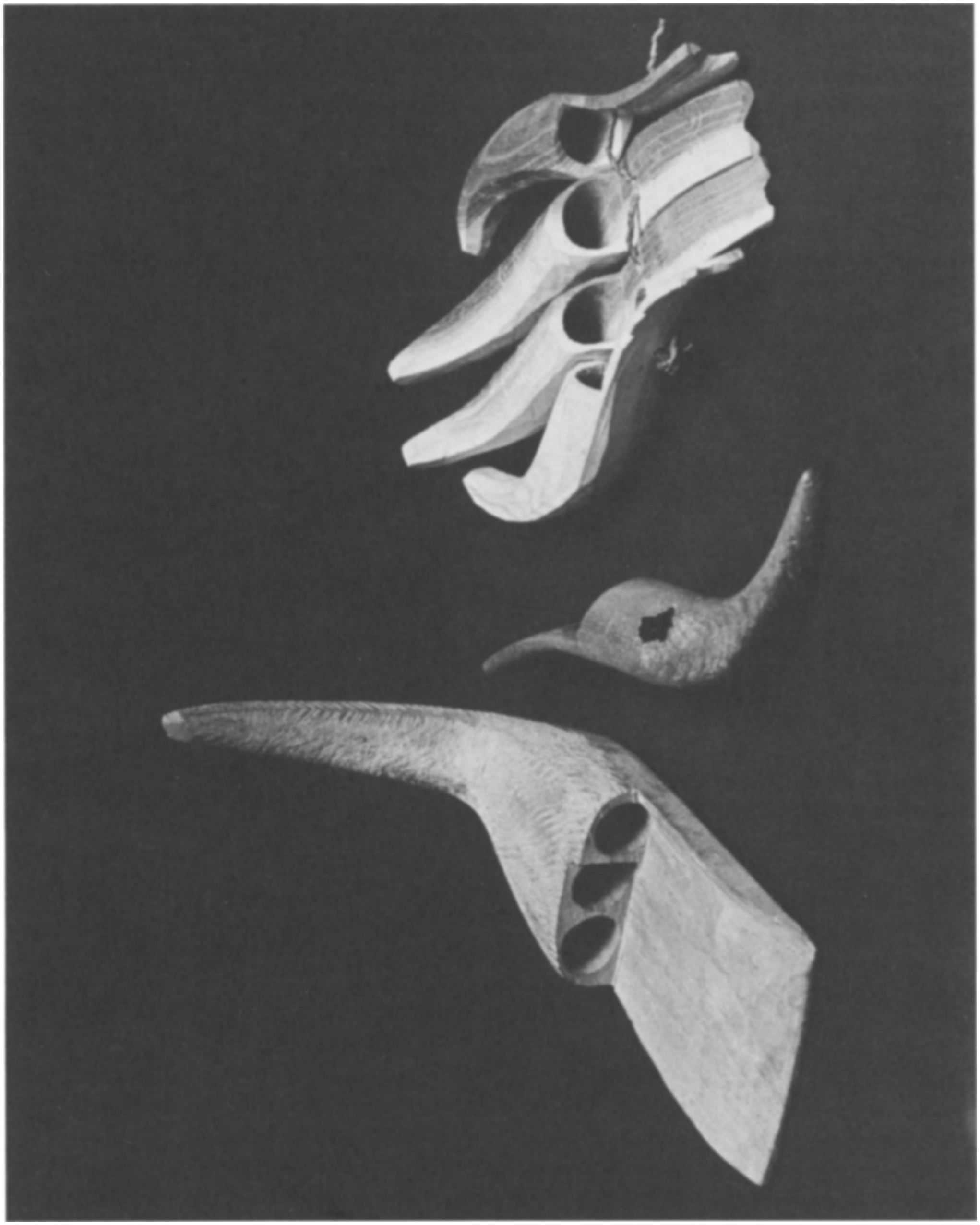

Fig. 20. Finger-guards for reaping, from Cappadocia (left), Macedonia (centre), and Pontos (right)

gadget, so transitory and insignificant that it has left no archaeological or documentary trace. Are the guard-hooks in FIG. 20 a Byzantine survival?

B.6. *ΒΑΤΟΚΟΠΙ(Ο)Ν/bramble-slasher*

The *batokopin* appears only once in a documentary source, the *Skaranos Will*, and once in our illustrations, by X. This shows it to have been identical to its classical predecessor, the *falcastrum* (White, 91). *Contra* Nesbitt, Thesis 115, it is not a scythe, nor is it a sickle, but the plain-bladed iron slasher shown in FIG. 14.

B.7. *ΚΛΑΔΕΥΤΗΡΙ(ΟΝ)/vine-dresser's knife*

This ancient, beautifully designed, and complex tool was already fully developed in Antiquity from the simple billhook, as the *falx vinitoria*. For those who have not adopted secateurs, invented by Bertrand de Molleville (1744–1818), the *kladeuterion* remains unchanged as the ideal pruning-hook. The most intricate examples incorporate six features. From the left of the handle, they are in turn: a knife-edge (thrust away), a hook (pull back), a short paring edge, a beak to the left, a spike to the top, and a small hatchet to the right. In Byzantine illustrations, only Paris. gr. 533 f. 23^{v} appears to show the spike (*mucro*), but otherwise our Illustrators VI, VII, IX, X, and XIII retain the other features, more or less. They survive, rather crudely in modern *kladeuteria*: Benaki, fig. 91; the olive pruning-hooks in figs. 68 and 69 are simpler. Cf. Koukoules, *BBP* v. 285.

A billhook, 17 cm long without handle, was found at *Păcuiul lui Soare* ii fig. 16.3. With the end of Pontic wine production after the departure of the Greeks, modern *kladeuterion* design seems to be receding to its billhook origins.

The elegant scissors depicted in a thirteenth-century wall-painting in Attica, which have been described as a vine-dresser's knife, look more like sheep shears to me: see Mouriki, pl. 90; cf. Paris. gr. 533 f. 34.

B.8. *ΦΥΤΕΥΤΗΡΙ(ΟΝ)/vine-fork*

Byzantines did not normally trellis vines; training them up olives was one method and vine-props evidently another. Our Illustrators IX, X, and XIII have simple forked wooden sticks, which appear to have left no other record; cf. White, 106.

B.9. *ΔΙΚΡΑΝΙ(ΟΝ)/pitchfork*

Related to the *phyteuterion*, the natural two-pronged wooden fork is named by our Illustrator X; cf. White, 104–5. Modern examples are in Benaki pl. 28 (the longest of 1.06 m) and in Bryer, *CS* vii figs. 17–18.

B.10. *ΛΙΚΜΗΤΗΡΙ(ΟΝ)/winnowing-fork*

Related to the *dikranion*, indeed Illustrator VII in FIG. 11 actually labels what is clearly a four-pronged wooden fork as a *dikranion*. The *likmeterion* is the classical *ventilabrum* (White, 32), ranging, at one end of its manifestations, from a naturally branched *dikranion* with more than two spikes, to, at the other, a near shovel of flat solid wood, which has been cut into tines of up to half its length; Illustrators VI, VII, IX, X, and XIII show the latter variety with four or five prongs—the example of XIII in FIG. 16 attempts to show hay and is of a puzzling frame construction.

Modern varieties are numerous: the Faltaits Museum has three prongs (Cheetham, Thesis fig. 3.4); the Benaki has καρπολογία with four and five prongs up to 1.54 m long (fig. 40); Bryer, *CS* vii fig. 18 has a Pontic *ἀλωνίφταρον* of four prongs. Prongs seem to multiply as one goes inland in Anatolia: the Tokat Museum exhibits five- and nine-pronged forks and I have seen six- and nine-pronged ones around Ankara.

B.11. *ΠΤΥΟΝ/winnowing-shovel*

Related to, and the natural development (or origin) of, the *likmeterion*, the shovel is a plain wooden board. Illustrators VI and X show a flat-ended shovel, which could sprout tines to become a fork. It is not a spade and, being wooden, is unsuitable for digging. The artist of FIG. 7 may, however, intend an iron tip, in which case it becomes a *vanga*; iron spade tips were found at *Dinogetia* 265; cf. Koukoules, *BBP* 264–5, 268; White, 17–35. Modern survivals are in Cheetham, Thesis fig. 3.4; Benaki fig. 37; Bryer, *CS* vii figs. 17, 18. The *φτυάρι* in Smith, *Chios* fig. 116 is a conventional modern spade.

B.12. *ΠΡΙΩΝ/frame-saw*, and B.13. *ΧΕΙΡΟΠΡΙΩΝ/handsaw*

Illustrator X alone includes both kinds of saw. The handsaw is a curved version of the Roman *serrula* (White, 116). The frame-saw is a handsome (and apparently unique) Byzantine illustration of its kind. Here the narrow two-handled blade (at bottom) is held in tension in a frame over a bar (centre) by a torque of twisted thongs (top).

B.14. *ΤΡΥΠΑΝΙ(ΟΝ)/auger*

Triklinios alone has an elegant boring tool in FIG. 10, the iron shaft of which has at least three threads. As there is no scale, it is difficult to tell whether a heavy auger or small gimlet is intended by this *trypanion*.

B.15. *ΣΜΙΛΑ/chisel*

To the right of his auger in FIG. 10, Triklinios includes an implement which is the modern *σμίλη*, or chisel, rather than the ancient scalpel.

B.16. *ΡΥΜΟΣΤΑΤΗΣ*

In FIG. 14, Illustrator X includes a *rhymostates* beneath the handsaw and the left of the axe. It is shown standing vertically, a pointed (conical?) stick with a base, like a sort of cricket stump. It is difficult to know what this is. Possibilities are a dibble, a spindle, or the peg which secures the plough-beam to either the yoke or sole. Suggestions are invited.

B.17. *ΤΥΚΑΝΗ, ΔΟ(Υ)ΚΑΝΗ/threshing-sledge*

Illustrator XIII shows in FIG. 16 one of what appear to be only two illustrations of the Byzantine threshing-sledge; the other is in Athos Esphigmenou 14 f. 386^{v} which shows a peasant riding a two-boarded sledge drawn by two oxen. Our example appears to be a single board, seen from below, in which numerous stones (today flints, obsidian chips, or iron teeth, even half ox-shoes or abandoned heel-tips) are embedded.

The classical *tribulum* was common to the drier parts of the Mediterranean (the flail, of which there seems to be no Byzantine illustration, is more suited to wetter climes where threshing must be done indoors). The *dokani* survives in many parts and has been investigated widely: e.g. White, 152–6; Cheetham, Thesis; Bryer, *CS* vii. What is surprising is how little such a commonplace implement is noted in medieval and even more recent sources: the earliest Western engraving of an Anatolian example does not seem to come until the *Voyage du Sieur Paul Lucas* (Amsterdam 1714) 182.

It was under the teeth of such threshing-sledges that the atrocious Nikephoros I supposedly tossed Bulgar babies for tribulation at Pliska on 20 July 811; Khan Krum had his revenge less than a week later when he was able to toast his boyars from that emperor's skull: R. Browning, *Byzantium and Bulgaria* (London 1975) 49. But this oft-cited Bulgarian atrocity has the air of a *topos* and its apparently sole source is late and otherwise vague: *Chronique de Michel le Syrien, patriarche Jacobite d'Antioche (1166–1199)*, ed. J.-B. Chabot, ii (Paris 1905) 17.

The *Skaranos Will* records two threshing-sledges and the Assizes of Cyprus refer to the δουκάνη: *Μεσαιωνική Βιβλιοθήκη* vi (Venice-Paris 1877) 240. Diana Wardle kindly informs me that modern variant names in Greek Macedonia are ἄσκανι, δόκανι, and δόγανα, and on Karpathos βελοσείρος.

I offer the following table as a start to an attempt to establish a typology of surviving threshing-sledges. At the moment it demonstrates no more than that it is individual craftsmen, rather than wider geographical or cultural considerations, which account for their range of construction, although a sledge for threshing, say, lentils is obviously smaller than the commoner corn sledge.

Place	Board	Size	Stones	Source
Melos	2	1.70 × 0.60 m	378	Benaki Museum
Andros	2	1.61 × 0.55 m	336	Benaki Museum
Azerbaijan	1		198	Leningrad Museum
Soviet Armenia	1		132	Leningrad Museum
Daghestan	2		299	Leningrad Museum
Chaldia, Soulamis	2	1.95 × 0.65 m	209	Bryer, *CS* vii
Chaldia, Choutoura	2		312	Bryer, *CS* vii
Chaldia, Tekke	2		312	Bryer seen 1985
İspir, for lentils	1		120	Bryer seen 1985
Bucharest	1		80	Village Museum
Greek Macedonia	2	1.54 × 0.84 m	397	Wardle Coll.
Greek Macedonia	2	1.20/1.80 × 0.50–0.80 m	60–700	Cheetham, Thesis
Cyprus	2	1.28 × 0.58	370	Winfield Coll. (some horseshoes)
Cyprus	2		345	0.65. Crawford, 'A Primitive Threshing Machine', *Antiquity* 9 (1935) 335–9

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Stop Press! I eat my words on p. 47 (cf. pp. 70, 79). There *is* evidence for Byzantine iron-shod spades. In 1326/7 the *Skouterios* Theodore Sarantinos willed two '*sidêroptya*' among 14 *tzapia* and 36 *dikellia*: G. I. Theocharides, *Mia diathêkê kai mia dikê Byzantinê* (Thessalonikê 1962) 23.

Dr John Lowden kindly adds to the sole ards in the Smyrna and Seraglio Octateuchs (p. 49) sickles, spade-forks, slashers, and surveying rods and chains in the Athos Vatopedi 602 and Vat. gr. 746 Octateuchs: D. C. Hesseling, *Miniatures de l'Octateuque Grec de Smyrne* (Leiden 1909) figs. 252, 262, 299, 302, 304, 305; Uspenskij, figs. 192, 263; P. Huber, *Bild und Botschaft* (Zürich 1973) figs. 48, 105, 107–9, 111; *Il Rotulo di Giosuè Codice Vaticano Palatino Graeco 431* (Milan 1905) pls. H1, 2 and I. 1.

A. A. M. B.